Nokia Customer Care

Service Manual

RM-227 (Nokia E61i)

Mobile Terminal

Part No: 9202447 (Issue 1)

COMPANY CONFIDENTIAL

NOKIA

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Amendment Record Sheet

Amendment No	Date	Inserted By	Comments
Issue 1	03/2007	MHa	

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Warnings and cautions

Warnings

- IF THE DEVICE CAN BE INSTALLED IN A VEHICLE, CARE MUST BE TAKEN ON INSTALLATION IN VEHICLES FITTED WITH ELECTRONIC ENGINE MANAGEMENT SYSTEMS AND ANTI-SKID BRAKING SYSTEMS. UNDER CERTAIN FAULT CONDITIONS, EMITTED RF ENERGY CAN AFFECT THEIR OPERATION. IF NECESSARY, CONSULT THE VEHICLE DEALER/ MANUFACTURER TO DETERMINE THE IMMUNITY OF VEHICLE ELECTRONIC SYSTEMS TO RF ENERGY.
- THE PRODUCT MUST NOT BE OPERATED IN AREAS LIKELY TO CONTAIN POTENTIALLY EXPLOSIVE ATMOSPHERES, FOR EXAMPLE, PETROL STATIONS (SERVICE STATIONS), BLASTING AREAS ETC.
- OPERATION OF ANY RADIO TRANSMITTING EQUIPMENT, INCLUDING CELLULAR TELEPHONES, MAY INTERFERE WITH THE FUNCTIONALITY OF INADEQUATELY PROTECTED MEDICAL DEVICES. CONSULT A PHYSICIAN OR THE MANUFACTURER OF THE MEDICAL DEVICE IF YOU HAVE ANY QUESTIONS. OTHER ELECTRONIC EQUIPMENT MAY ALSO BE SUBJECT TO INTERFERENCE.
- BEFORE MAKING ANY TEST CONNECTIONS, MAKE SURE YOU HAVE SWITCHED OFF ALL EQUIPMENT.

Cautions

- Servicing and alignment must be undertaken by qualified personnel only.
- Ensure all work is carried out at an anti-static workstation and that an anti-static wrist strap is worn.
- Ensure solder, wire, or foreign matter does not enter the telephone as damage may result.
- Use only approved components as specified in the parts list.
- Ensure all components, modules, screws and insulators are correctly re-fitted after servicing and alignment.
- Ensure all cables and wires are repositioned correctly.
- Never test a mobile phone WCDMA transmitter with full Tx power, if there is no possibility to perform the measurements in a good performance RF-shielded room. Even low power WCDMA transmitters may disturb nearby WCDMA networks and cause problems to 3G cellular phone communication in a wide area.
- During testing never activate the GSM or WCDMA transmitter without a proper antenna load, otherwise GSM or WCDMA PA may be damaged.

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ESD protection

Nokia requires that service points have sufficient ESD protection (against static electricity) when servicing the phone.

Any product of which the covers are removed must be handled with ESD protection. The SIM card can be replaced without ESD protection if the product is otherwise ready for use.

To replace the covers ESD protection must be applied.

All electronic parts of the product are susceptible to ESD. Resistors, too, can be damaged by static electricity discharge.

All ESD sensitive parts must be packed in metallized protective bags during shipping and handling outside any ESD Protected Area (EPA).

Every repair action involving opening the product or handling the product components must be done under ESD protection.

ESD protected spare part packages MUST NOT be opened/closed out of an ESD Protected Area.

For more information and local requirements about ESD protection and ESD Protected Area, contact your local Nokia After Market Services representative.

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Care and maintenance

This product is of superior design and craftsmanship and should be treated with care. The suggestions below will help you to fulfil any warranty obligations and to enjoy this product for many years.

- Keep the phone and all its parts and accessories out of the reach of small children.
- Keep the phone dry. Precipitation, humidity and all types of liquids or moisture can contain minerals that will corrode electronic circuits.
- Do not use or store the phone in dusty, dirty areas. Its moving parts can be damaged.
- Do not store the phone in hot areas. High temperatures can shorten the life of electronic devices, damage batteries, and warp or melt certain plastics.
- Do not store the phone in cold areas. When it warms up (to its normal temperature), moisture can form inside, which may damage electronic circuit boards.
- Do not drop, knock or shake the phone. Rough handling can break internal circuit boards.
- Do not use harsh chemicals, cleaning solvents, or strong detergents to clean the phone.
- Do not paint the phone. Paint can clog the moving parts and prevent proper operation.
- Use only the supplied or an approved replacement antenna. Unauthorised antennas, modifications or attachments could damage the phone and may violate regulations governing radio devices.

All of the above suggestions apply equally to the product, battery, charger or any accessory.

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Our policy is of continuous development; details of all technical modifications will be included with service bulletins.

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Battery information

Note: A new battery's full performance is achieved only after two or three complete charge and discharge cycles!

The battery can be charged and discharged hundreds of times but it will eventually wear out. When the operating time (talk-time and standby time) is noticeably shorter than normal, it is time to buy a new battery.

Use only batteries approved by the phone manufacturer and recharge the battery only with the chargers approved by the manufacturer. Unplug the charger when not in use. Do not leave the battery connected to a charger for longer than a week, since overcharging may shorten its lifetime. If left unused a fully charged battery will discharge itself over time.

Temperature extremes can affect the ability of your battery to charge.

For good operation times with Ni-Cd/NiMh batteries, discharge the battery from time to time by leaving the product switched on until it turns itself off (or by using the battery discharge facility of any approved accessory available for the product). Do not attempt to discharge the battery by any other means.

Use the battery only for its intended purpose.

Never use any charger or battery which is damaged.

Do not short-circuit the battery. Accidental short-circuiting can occur when a metallic object (coin, clip or pen) causes direct connection of the + and - terminals of the battery (metal strips on the battery) for example when you carry a spare battery in your pocket or purse. Short-circuiting the terminals may damage the battery or the connecting object.

Leaving the battery in hot or cold places, such as in a closed car in summer or winter conditions, will reduce the capacity and lifetime of the battery. Always try to keep the battery between 15°C and 25°C (59°F and 77°F). A phone with a hot or cold battery may temporarily not work, even when the battery is fully charged. Batteries' performance is particularly limited in temperatures well below freezing.

Do not dispose of batteries in a fire!

Dispose of batteries according to local regulations (e.g. recycling). Do not dispose as household waste.

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Nokia E61i Service Manual Structure

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4 Service Tools and Service Concepts
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7 RF Troubleshooting and Manual Tuning Guide
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1 — General Information

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RM-227 product selection

Nokia RM-227 is a WCDMA/GSM dual mode handportable phone, supporting EGSM850/900/1800/1900/ WCDMA2100.

The MMS implementation follows the OMA MMS standard release 1.2.

WAP 2.0 compatible browser supports XHTML Mobile Profile (MP) and uses a TCP/IP stack to communicate with a gateway in network.

RM-227 uses Symbian 9.1a operating system and supports also MIDP Java 2.0 & CLDC1.1, providing a good platform for 3rd party applications.

Figure 1 View of RM-227

RM-227 product features and sales package

Display and keypad

- Landscape active matrix colour display
- Active area: 56.9 x 42.7 mm
- 2.8 " QVGA (320 x 240), 16M colours
- Display contrast/brightness control
- Keys: silicon with hard tops

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- 4-way rocker switch with select, power key used as profile key, 2 soft keys
- MyOwn Key, Phonebook key
- Volume keys and voice key combining voice recording, voice dialling and push to talk functionality
- E-mail button, e-mail LED
- Full messaging keyboard with backlight (21 keypad variants)
- Ambient light sensor for keypad display lightning control

Hardware characteristics

- Monoblock with full messaging keyboard
- 128 MB of fixed user data memory
- MicroSD memory card (hot swap)
- Integrated Handsfree
- Internal vibra, SIM Card reader
- Dynamo charging jack

Connectivity

- WCDMA 3GPP Release 99 & EGSM 850/900/1800/1900
- WCDMA PS max speed UL/DL 384/384 kbps
- GPRS/EGPRS (Class B, MSC 32)
- GSM CSD up to 14.4 and 43.2 (HSCSD) kbps
- Speech codecs AMR, FR and EFR, NB-AMR
- Dual mode transfer MSC9, SAIC rel v1
- Integrated WLAN (IEEE 802.11g, 802.11e, 802.11i)
- E-mail data roaming
- Integrated infrared module (115 kbps)
- USB 2.0 full-speed, Pop-Port
- Bluetooth 1.2
- Remote & Local (peer-to-peer) synchronization over Bluetooth technology, IR, cable, http

Developer platform

- Series 60 Platform 3rd Edition 9.1a Mike
- MIDP2.0 Java

User interface

- Active Idle
- Tutorial

Messaging

- Push Email; IMAP (idle)
- POP/IMAP, SMTP
- Multimedia Messaging Service (MMS, ver. 1.2), SMS
- Instant messaging client (Yahoo, AOL, OMA)

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Voice

- Voice dialling, Voice commands for menu short cuts, keypad lock and profiles
- Voice recording, recording own notes or conversations
- Internet call (VoIP) release 2.0, Text-to-Speech message reader
- Enhanced voice commands (SIND), Voice aid, Push-to-talk

Device management

- Settings via OMA Client Provisioning, OMA Device Management
- OTA device programming (ringing tone, phone book, e-mail, WAP, MMS, operator logos, user group icons)
- OTA device wipe and lock
- AP configurator
- Data transfer
- WLAN settings wizard

Information management

- Quickoffice attachment editors and readers(Document, spreadsheet, presentation)
- Adobe acrobat reader, ZIP manager
- Basic PIM (Calendar, to-do, notes, contacts), TeamSuite, In-device search
- Remote and local synchronization of PIM via PC and remotely
- File manager
- PC suite 6.8
- Two browsers: xHTML and XHTML Browser
- External view framework, Bluetooth printing

Media Consumption

- 2 MPixel camera
- Catalogs client
- Video and audio streaming (3GPP & Real Media)
- MP3/ AAC player
- Instrumental downloadable MIDI ring tones
- Digital Rights Management (Forward lock)

TPO solutions

- E-mail:
  - Intellisync 7.x , Seven Always-on Mail
  - Visto Mobile v5.2, RIM BlackBerry Connect v2.1
  - GooldLink, MS Activesync
- Nokia Mobile VPN (Integrated)

Sales package

- Transceiver RM-227
- BP-4L Li-ion Battery Cell

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- AC-4 Charger
- All-in-one User Guide (warranty card + accessory info + getting started sheet + invitational module for Club Nokia)
- CD-ROM
- Headset HS-5
- Connectivity Cable CA-53
- Memory card Micro-SD (128 MB)*
- Application leaflet
- Quickstart guide

*The memory card is not included in the sales package in all market areas.

Product and module list

Module name	Type code	Notes
System/RF Module	1ZH	Main PWB with components
EL-Dome sheet		
Chassis Assy		
Display Module		
Keyboard		
A-cover Assy		
SW Module		

Mobile enhancements

Table 1 Audio

Enhancement	Type
Boom headset	HDB-4
Fashion stereo headset	HS-3
	HS-31
Headset	HS-5
Stereo headset	HDS-3
Classic stereo headset	HS-23
Display headset	HS-6
FM radio headset	HS-2R
Wireless headset	HDW-3
	HS-36W
	HS-37W
	HS-11W
	HS-26W

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Enhancement	Type
Wireless boom headset	HS-4W
Wireless clip-on headset	HS-21W
Wireless image headset	HS-13W
Loopset	LPS-4
TTY adapter	HDA-9

Table 2 Car

Enhancement	Type
Wireless car kit	CK-1W
Advanced car kit	CK-7W
	CK-10
Car kit phone	N616
Wireless plug-in car handsfree	HF-6W
Mobile charger	DC-4
Mobile holder	CR-47
Nokia Converter for Car Kit	Cark-91
Headrest handsfree	BHF-3
Plug-in car handsfree	HF-3

Table 3 Carrying

Enhancement	Type
Carrying case	CP-111

Table 4 Data

Enhancement	Type
Connectivity cable	CA-53
Wireless GPS module	LD-3W
MicroSD card 64 MB	
MicroSD card 128 MB	
MicroSD card 256 MB	
MicroSD card 512 MB	

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Table 5 Imaging

Enhancement	Type
Nokia image album	PD-1
Nokia remote camera	PT-6

Table 6 Messaging

Enhancement	Type
Wireless keyboard	SU-8W

Table 7 Power

Enhancement	Type
Battery	BP-4L
Travel charger	AC-4
Compact charger	AC-3
Charger adapter	CA-44

Technical specifications

Transceiver general specifications

Unit	Dimensions (L x W x T) (mm)	Weight (g)	Volume (cm^3)
Transceiver with BP-4L 1500mAh li-ion battery back	117.0 x 70 x 13.9/11.5	150 (including BP-4L battery)	97

Main RF characteristics for GSM850/900/1800/1900 and WCDMA 2100 phones

Parameter	Unit
Cellular system	GSM850, EGSM900, GSM1800/1900, WCDMA 2100
Rx frequency band	GSM850: 869 - 894MHz
	EGSM900: 925 - 960 MHz
	GSM1800: 1805 - 1880 MHz
	GSM1900: 1930 - 1990 MHz
	WCDMA2100: 2110 - 2170 MHz

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Parameter	Unit
Tx frequency band	GSM850: 824 - 849MHz
	EGSM900: 880 - 915 MHz
	GSM1800: 1710 - 1785 MHz
	GSM1900: 1850 - 1910 MHz
	WCDMA2100: 1920 - 1980 MHz
Output power	GSM850: +5 ...+33dBm/3.2mW ... 2W
	GSM900: +5 ... +33dBm/3.2mW ... 2W
	GSM1800: +0 ... +30dBm/1.0mW ... 1W
	GSM1900: +0 ... +30dBm/1.0mW ... 1W
	WCDMA -50 ... 24 dBm
Number of RF channels	GSM850: 124
	GSM900: 174
	GSM1800: 374
	GSM1900: 299
Number of WCDMA channels	WCDMA: 277
Channel spacing	200 kHz
Number of Tx power levels	GSM850: 15
	GSM900: 15
	GSM1800: 16
	GSM1900: 16

Battery endurance

Battery	Capacity (mAh)	Talk time	Stand-by
BP-4L	1500mAh	4 - 9 hours (GSM) 2 - 5 hours (WCDMA) 4 hours (VoIP)	12 - 17 days (GSM) 13 - 19 days (WCDMA) 8 - 9.5 days (GSM/ WCDMA and WLAN)

Charging times

ACP-4
2 h 10 min

Environmental conditions

Environmental condition	Ambient temperature	Notes
Normal operation	-15ºC...+55ºC	Specifications fulfilled

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Environmental condition	Ambient temperature	Notes
Reduced performance	-25ºC...-15ºC +55ºC...+70ºC	Operational for shorts periods only
Intermittent operation	-40ºC...-15ºC +70ºC...+85 ºC	Operation not guaranteed but an attempt to operate does not damage the phone.
No operation or storage	<-40ºC...>+85ºC	No storage or operation: an attempt may damage the phone.
Charging allowed	-25ºC...+50ºC	
Long term storage conditions	0ºC...+85ºC	

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2 — Parts Lists and Component Layouts

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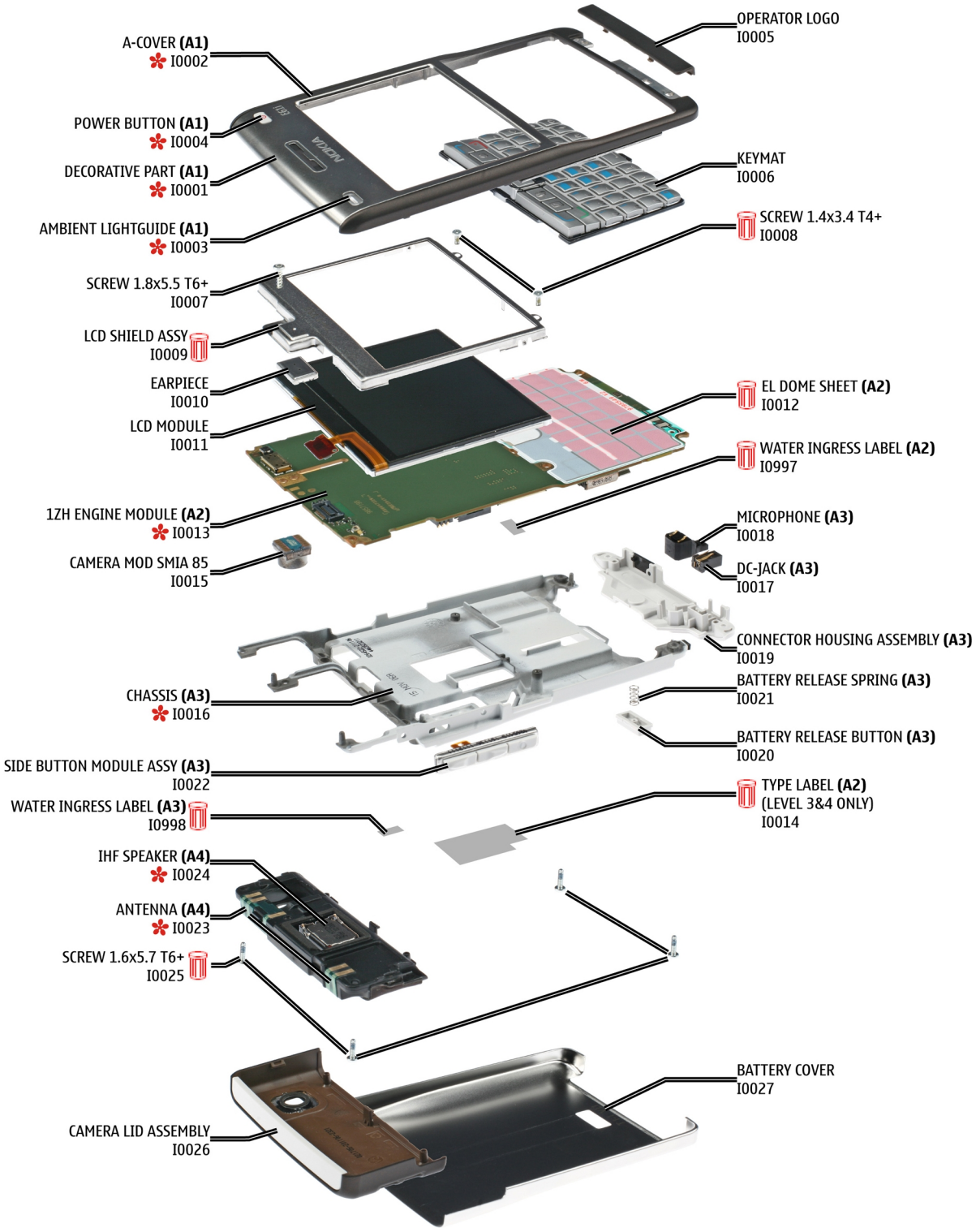
Exploded view



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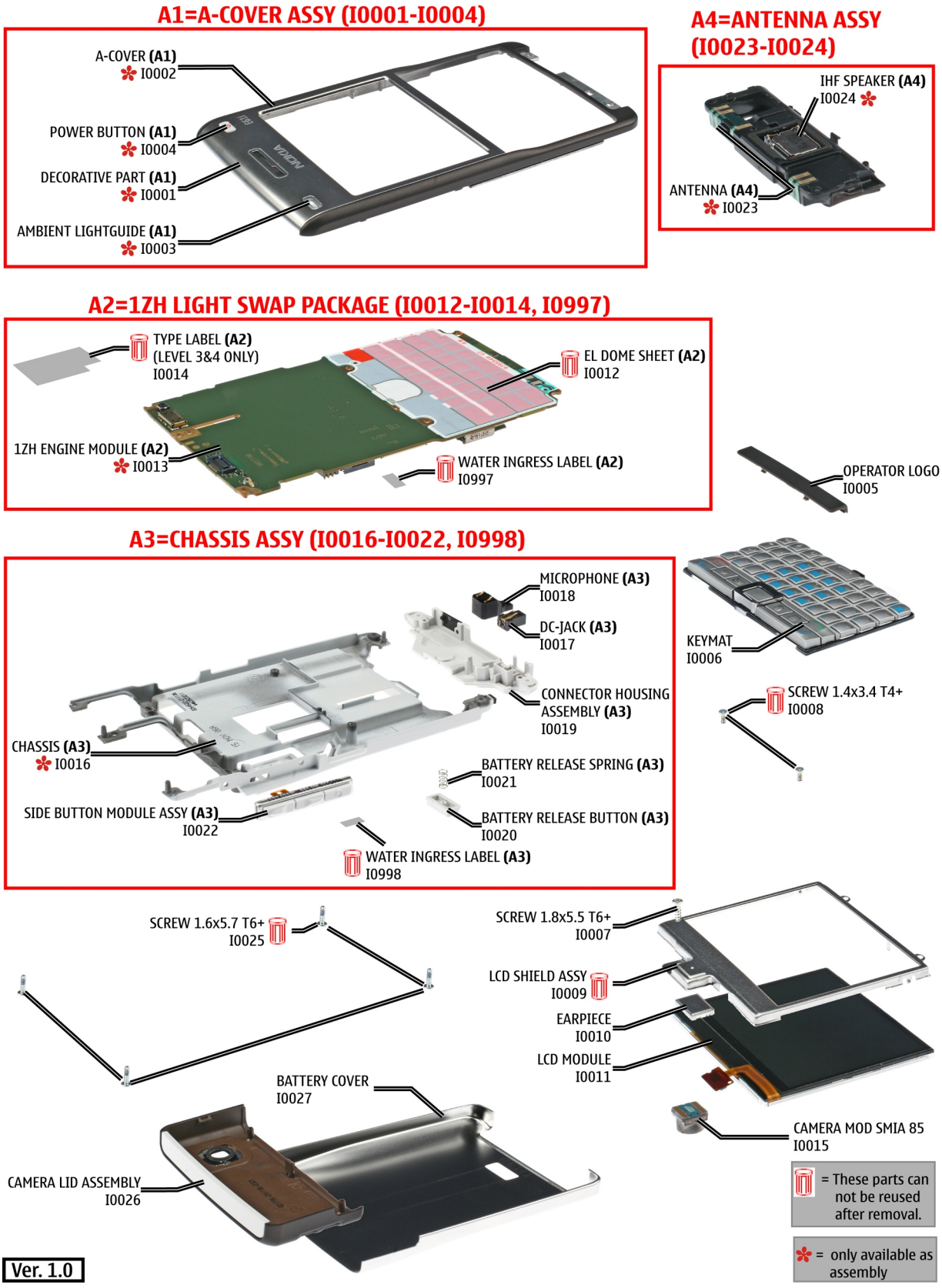
Spare parts overview



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Parts lists

Mechanical spare parts list

Note: For Nokia product codes, please refer to the latest Service Bulletins on the Partner Website (PWS).
To ensure you are always using the latest codes, please check the PWS on a daily basis.

ITEM/CIRCUIT REF.	QTY	SPARE PART DESCRIPTION
A1	1	A-COVER ASSY (I0001-I0004)
I0001	1	DECORATIVE PART
I0002	1	A-COVER
I0003	1	AMBIENT LIGHTGUIDE
I0004	1	POWER BUTTON
I0005	1	OPERATOR LOGO
I0006	1	KEYMAT
I0007	1	SCREW 1.8x5.5 T6+
I0008	2	SCREW M1.4X3.4 T4+
I0009	1	LCD SHIELD ASSY
I0010	1	EARPIECE
I0011	1	LCD MODULE
A2	1	1ZH LIGHT SWAP PACKAGE (I0012 - I0014, I0997)
I0012	1	EL-DOMESHEET
I0013	1	1ZH ENGINE MODULE
I0014	1	TYPE LABEL
I0997	1	WATER INGRESS LABEL
I0015	1	CAMERA MOD SMIA 85
A3	1	CHASSIS ASSY (I0016-I0022, I0998)
I0016	1	CHASSIS
I0017	1	DC-JACK
I0018	1	MICROPHONE
I0019	1	CONNECTOR HOUSING ASSEMBLY
I0020	1	BATTERY RELEASE BUTTON
I0021	1	BATTERY RELEASE SPRING
I0022	1	SIDE BUTTON MODULE ASSY
I0998	1	WATER INGRESS LABEL
A4	1	ANTENNA ASSY (I0023-I0024)

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ITEM/CIRCUIT REF.	QTY	SPARE PART DESCRIPTION
I0023	1	ANTENNA
I0024	1	IHF SPEAKER
I0025	4	SCREW M1.6X5.7 T6+
I0026	1	CAMERA LID ASSEMBLY
I0027	1	BATTERY COVER

Component parts list (1zh_08a)

Note: For Nokia product codes, please refer to the latest Service Bulletins on the Partner Website (PWS). To ensure you are always using the latest codes, please check the PWS on a daily basis.

Item	Side	Grid ref.		Type	Description and value		
A2200	Bot	D	7	SHIELD_PWB_CAN_WB	SHIELD PWB CAN WB	~	~
A2801	Bot	C	13	SHIELD_PWB_CAN_RAP	SHIELD PWB CAN RAP	~	~
A4801	Bot	K	12	SHIELD_040_017960	PWB CAN COMBO	~	~
A4802	Bot	L	7	SHIELD_PWB_CAN_APE	SHIELD PWB CAN APE	~	~
A6001	Bot	L	4	SHIELD_PWB_CAN_BT	SHIELD PWB CAN BT	~	~
A6302	Bot	H	5	SHIELD_040_032439	PWB_CAN_WLAN	~	~
A7000	Bot	I	15	SHIELD_040_037190	PWB_CAN_GE	~	~
A7503	Bot	D	16	SHIELD_PWB_CAN_WCDMA	SHIELD PWB CAN WCDMA	~	~
A7506	Bot	G	16	SHIELD_PWB_CAN_PA	SHIELD PWB CAN Pa	~	~
A7507	Bot	G	13	SHIELD_040_032484	PWB_CAN_PIHI_N	~	~
A7508	Top	K	22	SHIELD_040_032485	PWB_CAN_ANT	~	~
B2200	Bot	E	8	CRYSTAL_FC_135	CRYSTAL 32.768KHZ +-20PPM 12.5PF	32.768kHz	~
C1553	Bot	K	20	0402C	Chipcap 5% NP0	27p	50V
C1554	Bot	L	20	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C1555	Bot	K	22	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V

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Item	Side	Grid ref.		Type	Description and value		
C1556	Bot	L	22	0402C	Chipcap 5% NP0	27p	50V
C1557	Bot	J	16	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C1558	Bot	I	15	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C1559	Bot	I	16	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C1560	Bot	J	15	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C1561	Bot	K	19	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C1562	Bot	J	20	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C1563	Bot	I	14	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C1564	Bot	I	15	0603C	CHIPCAP X5R 10UF 6V3 0603	10u	4V
C1565	Bot	K	20	0402C	Chipcap X5R 10% 6.3V 0402	220n	6.3V
C1566	Bot	J	16	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C1567	Bot	K	19	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C1569	Bot	I	17	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C1570	Bot	J	17	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C1571	Bot	I	17	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C2000	Bot	D	4	0402C	Chipcap 5% NP0	27p	50V
C2001	Bot	D	4	0603C_H0.95	CHIPCAP X5R 470N K 25V 0603	470n	25V
C2005	Bot	F	3	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C2006	Bot	G	3	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C2071	Bot	M	18	TANT_C_6.2X3.4_H1.7	CHIPTCAP 150U M 10V 6X3.2X1.5	150u_10V	10V
C2101	Bot	C	17	0402C	Chipcap 5% NP0	68p	50V
C2102	Bot	C	17	0402C	Chipcap 5% NP0	68p	50V

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Item	Side	Grid ref.		Type	Description and value		
C2103	Top	F	23	0402C	Chipcap 5% X7R	1n0	50V
C2104	Top	F	22	0402C	Chipcap 5% X7R	1n0	50V
C2105	Bot	C	17	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2106	Bot	C	9	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2107	Bot	C	8	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2108	Bot	B	9	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2109	Bot	B	9	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2110	Bot	B	9	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2201	Bot	D	7	0402C	CHIPCAP X5R 1U5 K 4V 0402	1u5	4V
C2205	Bot	D	9	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2211	Bot	C	8	0805C	CHIPCAP X5R 4U7 K 10V 0805	4u7	10V
C2213	Bot	E	7	0405_DUAL	CHIPCAP NETWORK X5R 2X1U5 K 6V3 0405	2x1u5	6.3V
C2215	Bot	D	7	0405_DUAL	CHIPCAP NETWORK X5R 2X1U5 K 6V3 0405	2x1u5	6.3V
C2216	Bot	E	7	0402C	CHIPCAP X5R 1U5 K 4V 0402	1u5	4V
C2217	Bot	C	9	0402C	CHIPCAP X5R 1U5 K 4V 0402	1u5	4V
C2220	Bot	C	8	0405_DUAL	CHIPCAP NETWORK X5R 2X1U5 K 6V3 0405	2x1u5	6.3V
C2222	Bot	C	7	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2225	Bot	C	7	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2226	Bot	D	7	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2227	Bot	D	7	0405_DUAL	CHIPCAP NETWORK X5R 2X1U5 K 6V3 0405	2x1u5	6.3V
C2228	Bot	D	7	0405_DUAL	CHIPCAP NETWORK X5R 2X1U5 K 6V3 0405	2x1u5	6.3V

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Item	Side	Grid ref.		Type	Description and value		
C2231	Bot	C	9	0805C	CHIPCAP X5R 10U M 6V3 0805	10U	6V3
C2232	Bot	C	7	0405_DUAL	CHIPCAP NETWORK X5R 2X1U5 K 6V3 0405	2x1u5	6.3V
C2235	Bot	D	9	0603C	CHIPCAP X5R 2U2 K 6V3 0603	2u2	6V3
C2236	Bot	E	9	0603C	CHIPCAP X5R 2U2 K 6V3 0603	2u2	6V3
C2237	Bot	D	6	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2238	Bot	E	9	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2239	Bot	E	14	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2300	Bot	C	5	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C2301	Bot	C	5	0805C	CHIPCAP X5R 22U M 6V3 0805	22u	6V3
C2302	Bot	C	6	0805C	CHIPCAP X5R 22U M 6V3 0805	22u	6V3
C2303	Bot	E	5	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2304	Bot	D	6	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C2307	Bot	E	4	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2309	Bot	C	6	0805C	CHIPCAP X5R 22U M 6V3 0805	22u	6V3
C2312	Bot	E	5	0405_DUAL	CHIPCAP NETWORK X5R 2X1U5 K 6V3 0405	2x1u5	6.3V
C2314	Bot	D	4	0805C	CHIPCAP X5R 4U7 M 25V 0805	4u7	25V
C2315	Bot	C	5	0805C	CHIPCAP X5R 4U7 M 25V 0805	4u7	25V
C2700	Bot	C	17	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C2800	Bot	B	13	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C2801	Bot	E	13	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V

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Item	Side	Grid ref.		Type	Description and value		
C2802	Bot	E	13	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C2803	Bot	E	12	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C2804	Bot	B	11	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C2805	Bot	C	14	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C2806	Bot	C	11	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C2807	Bot	B	12	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C2808	Bot	B	14	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C2809	Bot	E	13	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C2810	Bot	D	14	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C2811	Bot	E	13	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C2812	Bot	C	14	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C2813	Bot	B	12	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C2814	Bot	B	14	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C2815	Bot	C	11	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C2816	Bot	D	11	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C2817	Bot	B	11	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C2818	Bot	B	14	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C2819	Bot	B	13	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C2820	Bot	B	11	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C2821	Bot	D	11	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V

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Item	Side	Grid ref.		Type	Description and value		
C2822	Bot	E	12	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C4200	Bot	C	11	0805C	CHIPCAP X5R 22U M 6V3 0805	22u	6V3
C4201	Bot	C	9	0805C	CHIPCAP X5R 22U M 6V3 0805	22u	6V3
C4202	Bot	B	9	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C4400	Bot	G	18	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C4401	Bot	F	18	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C4402	Bot	G	17	0402C	Chipcap 5% NP0	27p	50V
C4403	Bot	F	17	0402C	Chipcap 5% NP0	27p	50V
C4404	Bot	A	5	0402C	Chipcap 5% NP0	68p	50V
C4405	Bot	A	5	0402C	CHIPCAP X7R 15N K 16V 0402	15n	16V
C4406	Bot	C	3	0402C	CHIPCAP X5R 1U K 6V3 0402	1u0	6.3V
C4409	Bot	K	1	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C4410	Bot	I	2	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C4414	Bot	A	3	0603C	CHIPCAP X5R 1U K 16V 0603	1u0	16V
C4415	Top	C	23	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C4416	Bot	I	3	0402C	Chipcap 5% NP0	27p	50V
C4420	Top	C	23	0402C	Chipcap 5% NP0	27p	50V
C4421	Top	C	22	0402C	Chipcap 5% NP0	27p	50V
C4800	Bot	K	11	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C4801	Bot	I	12	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C4802	Bot	J	13	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C4803	Bot	I	12	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C4804	Bot	K	11	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V

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Item	Side	Grid ref.		Type	Description and value		
C4805	Bot	I	11	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C4806	Bot	L	13	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C4807	Bot	L	11	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C4808	Bot	I	11	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C4809	Bot	K	13	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C4810	Bot	I	13	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C4811	Bot	L	11	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C4812	Bot	L	12	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C4813	Bot	J	13	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C5000	Bot	K	8	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C5001	Bot	M	8	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C5002	Bot	L	8	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C5003	Bot	J	7	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C5004	Bot	M	8	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C5005	Bot	M	7	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C5006	Bot	J	8	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C5200	Bot	J	15	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C5201	Bot	I	16	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C5202	Bot	I	16	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C5203	Bot	I	15	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V

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Item	Side	Grid ref.		Type	Description and value		
C5204	Bot	I	15	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C6030	Bot	L	4	0402C	Chipcap 5% NP0	100p	50V
C6031	Bot	K	5	0402C	Chipcap 5% NP0	15p	50V
C6033	Bot	M	4	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C6036	Bot	K	5	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C6037	Bot	L	5	0402C	CHIPCAP X5R 1U K 6V3 0402	1u0	6.3V
C6038	Bot	M	5	0402C	CHIPCAP X5R 1U K 6V3 0402	1u0	6.3V
C6039	Bot	L	4	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C6040	Bot	L	4	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C6041	Bot	M	4	0402C	CHIPCAP X5R 0U47 K 6.3V 0402	0u47	6V3
C6042	Bot	L	5	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C6043	Bot	L	5	0402C	CHIPCAP X5R 0U47 K 6.3V 0402	0u47	6V3
C6044	Bot	K	4	0402C	CHIPCAP X5R 1U K 6V3 0402	1u0	6.3V
C6045	Bot	K	4	0402C	CHIPCAP X5R 1U K 6V3 0402	1u0	6.3V
C6051	Bot	K	4	0402C	Chipcap 5% NP0	10p	50V
C6300	Bot	G	4	0805C	CHIPCAP X5R 22U M 6V3 0805	22u	6V3
C6301	Bot	G	5	0402C	CHIPCAP X5R 1U K 6V3 0402	1u0	6.3V
C6302	Bot	G	5	0402C	CHIPCAP X5R 1U K 6V3 0402	1u0	6.3V
C6303	Bot	G	4	0603C	CHIPCAP X5R 2U2 K 6V3 0603	2u2	6V3
C6307	Bot	I	5	0402C	CHIPCAP X5R 1U K 6V3 0402	1u0	6.3V
C6308	Bot	I	4	0402C	Chipcap +-0.25pF NP0	6p8	50V
C6329	Bot	K	3	0402C	Chipcap +-0.25pF NP0	6p8	50V

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Item	Side	Grid ref.		Type	Description and value		
C6330	Bot	L	3	0603C	CHIPCAP X5R 2U2 K 6V3 0603	2u2	6V3
C6335	Bot	J	3	0402C	CHIPCAP NP0 220P J 25V 0402	220p	25V
C6338	Bot	K	3	0402C	Chipcap 5% NP0	47p	50V
C6348	Bot	G	5	0402C	CHIPCAP X5R 1U K 6V3 0402	1u0	6.3V
C6396	Bot	K	4	0402C	Chipcap +-0.25pF NP0	6p8	50V
C6397	Bot	K	4	0402C	Chipcap +-0.25pF NP0	6p8	50V
C6398	Bot	J	4	0402C	Chipcap +-0.25pF NP0	6p8	50V
C6399	Bot	J	4	0402C	Chipcap +-0.25pF NP0	6p8	50V
C6400	Bot	H	4	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C6401	Bot	H	6	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C6402	Bot	I	5	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C6403	Bot	I	4	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C6410	Bot	I	1	0402C	Chipcap +-0.25pF NP0	1p5	50V
C7500	Bot	F	14	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C7501	Bot	G	12	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C7502	Bot	H	12	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C7503	Bot	F	14	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C7504	Bot	G	11	0402C	Chipcap 5% X7R	3n9	50V
C7505	Bot	G	12	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C7506	Bot	F	12	0402C	Chipcap 5% NP0	27p	50V
C7507	Bot	F	15	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C7508	Bot	F	12	0402C	Chipcap 5% NP0	10p	50V
C7509	Bot	F	12	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C7510	Bot	G	11	0402C	CHPCAP NP0 470P J 50V 0402	470p	50V

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Item	Side	Grid ref.		Type	Description and value		
C7511	Bot	F	12	0402C	CHIPCAP X7R 33N K 10V 0402	33n	10V
C7512	Bot	G	11	0603C	CHIPCAP NP0 2N2 G 16V 0603	2n2	16V
C7514	Bot	F	14	0402C	Chipcap +-0.25pF NP0	2p2	50V
C7515	Bot	G	14	0402C	Chipcap +-0.25pF NP0	2p7	50V
C7516	Bot	F	11	0402C	CHIPCAP NP0 0P5 C 50V 0402	0p5	50V
C7518	Bot	E	13	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C7521	Bot	H	17	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C7527	Bot	F	15	0402C	Chipcap +-0.25pF NP0	1p2	50V
C7541	Bot	E	15	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C7542	Bot	E	16	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C7543	Bot	D	16	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C7544	Bot	E	17	0402C	CERCAP X7R 22N K 16V 0402	22n	16V
C7545	Bot	E	17	0402C	Chipcap 5% NP0	10p	50V
C7547	Bot	H	13	0402C	Chipcap +-0.25pF NP0	1p8	50V
C7565	Bot	F	14	0402C	Chipcap 5% NP0	12p	50V
C7566	Bot	E	13	0402C	Chipcap 5% NP0	12p	50V
C7591	Top	K	22	0402C	Chipcap 5% NP0	100p	50V
C7593	Top	J	22	0402C	Chipcap +-0.25pF NP0	8p2	50V
C7594	Top	J	23	0402C	Chipcap 5% NP0	12p	50V
C7595	Top	K	22	0402C	Chipcap 5% NP0	12p	50V
C7597	Top	J	22	0402C	Chipcap +-0.25pF NP0	2p2	50V
D1550	Bot	J	16	TFBGA84	HW ACCELERATOR STV0984N	~	~
D2800	Bot	C	13	VFBGA343	RAP3GS V2.0E-PA VFBGA	~	~
D2801	Bot	C	13	FBGA128_EMPTY	COMBO 128M NOR +128M DDR DRAM FBGA128	8Mx16 / 8Mx16	~
D4800	Bot	K	12	uBGA_289	HELEN3 PS2.0 N3 F761909 C27 UBGA289	~	~

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Item	Side	Grid ref.		Type	Description and value		
D5000	Bot	L	7	FBGA133_10.1X13.1_H1.1	COMBO 512 DDR + 1G NAND FBGA133 PBFR	32Mx16/128Mx8	~
D6030	Bot	J	4	XBGA_N5_H0.625	OR-GATE 2INPUT 74LVC1G32YZTR WCSP-5	~	~
F2000	Bot	C	4	0603_FUSE_AVX2MATS	SM FUSE F 2.0A 32V	2A	~
G2200	Bot	E	10	BATTER_EECEP	RTC BACUP CAPAC 311 SIZE FOR 2.6V 4UAH	2.6V	~
G6030	Bot	K	5	VCTCXO_3.4X2.7_4P2_H1.0	TCXO 38.4MHZ +-10PPM 2.78V	38.4MHz	~
G7500	Bot	H	12	NKG3176B_H1.0	VCTCXO 38.4MHZ 2.5V 2MA	38.4MHz	~
G7501	Bot	F	12	VCO_FDK_WB002	VCO 3296-3980MHZ 2.7V 20MA EGSM	3296-3980MHz	~
L1550	Bot	K	19	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/100MHz	~
L1552	Bot	L	22	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/100MHz	~
L1553	Bot	I	14	INDUCTOR_MDT2520	INDUCT ML CHIP PWR 1UH0 0R13 1A5	1uH	~
L2000	Bot	C	3	0603_BLM	FERR.BEAD 220R/100M 2A 0R05 0603	220R/100MHz	~
L2001	Bot	G	3	0405_2_H1.0	CHIP BEAD ARRAY 2X1000R 0405	2x1000R/100MHz	~
L2002	Bot	G	2	0405_2_H1.0	CHIP BEAD ARRAY 2X1000R 0405	2x1000R/100MHz	~
L2003	Bot	G	3	0405_2_H1.0	CHIP BEAD ARRAY 2X1000R 0405	2x1000R/100MHz	~
L2100	Top	F	22	0405_2_H1.0	CHIP BEAD ARRAY 2X1000R 0405	2x1000R/100MHz	~

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Item	Side	Grid ref.		Type	Description and value		
L2101	Bot	C	9	0603_BLM	FERR.BEAD 220R/100M 2A 0R05 0603	220R/ 100M Hz	~
L2102	Bot	H	21	COIL_0603CS	CHIP COIL 56N J Q38/250MHZ 0603	56nH	~
L2103	Bot	H	21	COIL_0603CS	CHIP COIL 56N J Q38/250MHZ 0603	56nH	~
L2104	Bot	C	8	0603_BLM	FERR.BEAD 220R/100M 2A 0R05 0603	220R/ 100M Hz	~
L2105	Bot	B	9	0402L_XL	FERRITE BEAD 220R 0R45 0.3A 0402	220R/ 100M Hz	~
L2106	Bot	B	9	0402L_XL	FERRITE BEAD 220R 0R45 0.3A 0402	220R/ 100M Hz	~
L2202	Bot	C	7	0603_BLM	FERR.BEAD 220R/100M 2A 0R05 0603	220R/ 100M Hz	~
L2205	Bot	C	9	0603_BLM	FERR.BEAD 220R/100M 2A 0R05 0603	220R/ 100M Hz	~
L2301	Bot	C	5	0603_BLM	FERR.BEAD 220R/100M 2A 0R05 0603	220R/ 100M Hz	~
L2302	Bot	C	6	CHOKE_SER400	CHOKE 10U 0.8A 0R24 4X4X1.8	10uH	~
L2304	Bot	C	5	CHOKE_SER300_H1.5	CHOKE 22U M 0R7 0.35A 3.0x3.0x1.5	22uH	~
L4200	Bot	B	10	CHOKE_SER400	CHOKE 10U 0.8A 0R24 4X4X1.8	10uH	~
L4201	Bot	B	9	0603_BLM	FERR.BEAD 220R/100M 2A 0R05 0603	220R/ 100M Hz	~
L4400	Bot	G	18	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/ 100M Hz	~
L4401	Bot	F	18	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/ 100M Hz	~
L4402	Bot	B	3	CHOKE_ELT3KN152C	COIL 0.47MH 50MA 3.3X3.4X1.4MM	0.47M H	~

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Item	Side	Grid ref.		Type	Description and value		
L5200	Bot	J	14	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/ 100M Hz	~
L6030	Bot	K	5	0402L	CHIP COIL 22N J Q28/800M 0402	22nH	~
L6031	Bot	L	4	0402L	CHIP COIL 2N2+-0N3 Q30/800M 0402	2n2H	~
L6302	Bot	J	1	FERRITE_LQP10	CHIP COIL 1N0 +-0N1 Q50/1GHZ 0402	1nH	~
L7500	Bot	F	13	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/ 100M Hz	~
L7520	Bot	H	16	FERRITE_FBMJ1608	FERRITE BEAD 0R01 28R/100MHZ 0603	28R/ 100M Hz	~
L7527	Bot	F	16	0402L	CHIP COIL 2N7+-0N3 Q29/800M 0402	2n7H	~
L7540	Bot	D	15	CHOKE_SER300_H1.5	CHOKE 3U3 1.2A 0R096 3X3X1.5	3u3H	~
L7541	Bot	E	17	0402L	CHIP COIL 22N J Q28/800M 0402	22nH	~
L7543	Bot	H	13	0402L	CHIP COIL 3N3 +-0N3 Q28/800M 0402	3n3H	~
L7591	Top	J	22	0402L	CHIP COIL 3N3 +-0N3 Q28/800M 0402	3n3H	~
M2100	Bot	B	7	VIBRA_M_KHN4NX1RA	SMD VIBRA MOTOR 1.3V 80MA 9000RPM	~	~
N1551	Bot	J	19	USMD5_1.47X1.04_H0.675	VREG LP3985ITLX-2.8 NOPB USMD5	~	3V
N1552	Bot	I	14	USMD5_1.518X1.137	DC/DC CONV 1.8V 600MA 3MHZ WLCSP5	~	~
N2200	Bot	D	8	TFBGA_105	AVILMA 1.05C BB MODULE TFBGA105	~	~
N2300	Bot	D	5	TFBGA64_H1.2	BETTY V2.1 & V2.2 LFA TFBGA64	~	~
N2301	Bot	C	5	USMD8_1.69X1.69	WHITE LED DRIVER 4LEDS 500MW 8BUMP USMD8	~	~
N4200	Bot	D	10	USMD_10_2.458X1.899	DC/DC CONV LM3661-1.40V/1.05V NOPB	~	~

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Item	Side	Grid ref.		Type	Description and value		
N4402	Bot	B	4	MSOP_10	EL DRIVER D381B 2-7V MSOP-10	~	~
N4403	Bot	I	14	SC70_5	1XOP AMP 2.7-5.5V LMV321 SC70-5	~	~
N4404	Bot	B	3	SOT_666	TRX2+RX4 PEMD9 N&P 10K/47K 0W12 SOT666	~	~
N5200	Bot	I	16	USMD16_2.03X2.03	VREG & LEVEL SHIFT LP3928 USMD16	~	2.8V
N5201	Bot	I	15	USMD16_2.03X2.03	VREG & LEVEL SHIFT LP3928 USMD16	~	2.8V
N6030	Bot	L	5	uBGA63_4.6X4.6	BRF6150	~	~
N6031	Bot	K	4	FC_4_0.99X0.99	LI VREG TK63128B 2.8V WLCSP4	~	2.8V
N6300	Bot	H	5	LFBGA240	WLAN MCM STLC4550 LFBGA240	~	~
N6301	Bot	K	3	RF5924	WLAN RF5924 ES3.5	~	~
N7500	Bot	G	13	TFBGA_188_H1.4	PIHI N2.0 RF SYSTEM MODULE	~	~
N7520	Bot	G	16	RF9282E3.6_4CM	PA RF9282E6.5 GSM/ EDGE 850/900/1800/1900	~	~
N7540	Bot	E	16	RF9372_H1.5	PA MODULE RF9372E5.2 WCDMA 1850-1980MHZ	~	~
N7541	Bot	E	15	uBGA8_1.849X1.696	DC CONV LM3202TLX NOPB REVB USMD8	~	~
N7590	Top	K	22	SC70_6_FAIR	HIGH POWER SPDT RF SW SC70	~	~
R1500	Bot	L	13	0402R	CHIPRES 0W06 10K F 0402	10k	~
R1550	Bot	L	20	0402R	Resistor 5% 63mW	4k7	~
R1551	Bot	L	20	0402R	Resistor 5% 63mW	4k7	~
R1555	Bot	K	13	0402R	Resistor 5% 63mW	100R	~
R1556	Bot	K	13	0402R	Resistor 5% 63mW	100R	~
R1567	Bot	I	17	0402R	Resistor 5% 63mW	4k7	~
R1568	Bot	J	17	0402R	Chipres 0W06 jumper 0402	0R	~
R1573	Bot	I	15	0402R	Resistor 5% 63mW	4k7	~
R1574	Bot	J	15	0402R	Resistor 5% 63mW	4k7	~
R2000	Bot	G	3	0402R	Resistor 5% 63mW	10R	~

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Item	Side	Grid ref.		Type	Description and value		
R2001	Bot	F	3	0402R	Resistor 5% 63mW	10R	~
R2002	Bot	G	2	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/ 50V	~
R2003	Bot	F	2	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/ 50V	~
R2004	Bot	E	4	0402R	Resistor 5% 63mW	100R	~
R2006	Bot	G	3	BGA11	ASIP 4 LINES AUDIO FILTER BGA11	~	~
R2007	Bot	F	2	uBGA11_1.6X2.15	ASIP SILIC USB OTG / ESD BGA11	~	~
R2010	Bot	F	2	0402R	Resistor 5% 63mW	220k	~
R2015	Bot	D	4	BGA_4	ASIP TVS BGA4	~	~
R2070	Bot	K	17	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/ 50V	~
R2071	Bot	C	7	0402_NTH5	NTC RES 47K J B=4050 +-3% 0402	47k	~
R2104	Top	F	22	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/ 50V	~
R2105	Top	F	23	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/ 50V	~
R2106	Bot	C	17	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/ 50V	~
R2107	Bot	C	17	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/ 50V	~
R2200	Bot	D	9	0402R	Resistor 5% 63mW	1k0	~
R2201	Bot	D	9	0402R	Chipres 0W06 jumper 0402	0R	~
R2302	Bot	D	5	0402R	Resistor 5% 63mW	100R	~
R2303	Bot	D	5	0402R	Resistor 5% 63mW	33R	~
R2800	Bot	B	13	0402R	Resistor 5% 63mW	10R	~
R2801	Bot	C	11	0402R	Resistor 5% 63mW	4k7	~
R2802	Bot	B	12	0402R	Resistor 5% 63mW	4k7	~
R2803	Bot	B	13	0402R	Resistor 5% 63mW	4k7	~
R4400	Top	C	22	0402R	Resistor 5% 63mW	470k	~
R4401	Top	B	22	0402R	Resistor 5% 63mW	100k	~
R4402	Top	C	22	0402R	Resistor 5% 63mW	470k	~
R4403	Top	C	22	0402_NTH5	NTC RES 47K J B=4050 +-3% 0402	47k	~

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Item	Side	Grid ref.		Type	Description and value		
R4404	Bot	A	3	0402R	Chipres 0W06 jumper 0402	0R	~
R4406	Top	L	23	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/ 50V	~
R4407	Bot	I	13	0402R	Resistor 5% 63mW	18R	~
R4408	Bot	C	3	0402R	Chipres 0W06 5% 0402	3M3	~
R4409	Bot	I	13	0402R	Resistor 5% 63mW	33R	~
R4410	Bot	H	14	0402R	Resistor 5% 63mW	1k0	~
R4411	Bot	B	5	0402R	Resistor 5% 63mW	82k	~
R4412	Top	B	22	0402R	Resistor 5% 63mW	680R	~
R4413	Top	C	22	0402R	Resistor 5% 63mW	1k0	~
R4414	Bot	B	2	0402R	Resistor 5% 63mW	100k	~
R4423	Bot	K	1	0805R_THERM1	CHIPRES 0W125 4R7 J 0805	4R7	~
R4506	Bot	B	17	0402R	Chipres 0W06 jumper 0402	0R	~
R4507	Bot	B	17	0402R	Chipres 0W06 jumper 0402	0R	~
R4508	Bot	B	17	0402R	Chipres 0W06 jumper 0402	0R	~
R4509	Bot	B	16	0402R	Chipres 0W06 jumper 0402	0R	~
R4800	Bot	K	11	0402R	Resistor 5% 63mW	10R	~
R4801	Bot	H	6	0402R	Resistor 5% 63mW	47R	~
R4802	Bot	H	6	0402R	Resistor 5% 63mW	47R	~
R4809	Bot	I	13	0402R	Resistor 5% 63mW	1k0	~
R5200	Bot	I	17	0402R	Resistor 5% 63mW	680R	~
R5201	Bot	I	17	0402R	Resistor 5% 63mW	1k2	~
R5202	Bot	J	17	0402R	Resistor 5% 63mW	100k	~
R5203	Bot	J	14	0402R	Resistor 5% 63mW	100k	~
R5204	Bot	J	14	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/ 50V	~
R5205	Bot	J	17	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/ 50V	~
R6054	Bot	L	5	0402R	Resistor 5% 63mW	100k	~
R6055	Bot	J	5	0402R	Resistor 5% 63mW	100k	~
R6065	Bot	M	5	0402R	Resistor 5% 63mW	10k	~

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Item	Side	Grid ref.		Type	Description and value		
R6300	Bot	I	5	0402R	CHIPRES 0W06 1M F 100PPM 0402	1M0	~
R6301	Bot	I	5	0402R	Resistor 5% 63mW	10k	~
R6304	Bot	I	5	0402R	Resistor 5% 63mW	100R	~
R7500	Bot	G	12	0402R	Resistor 5% 63mW	22k	~
R7501	Bot	F	15	0402R	Resistor 5% 63mW	4k7	~
R7503	Bot	G	12	0402R	CHIPRES 0W06 1K0 F 200PPM 0402	1k0	~
R7504	Bot	G	12	0402R	CHIPRES 0W06 8K2 F 0402	8k2	~
R7509	Bot	F	12	0402R	Chipres 0W06 5R6 J 0402	5R6	~
R7520	Bot	H	16	0402R	CHIPRES 0W06 27K F 0402	27k	~
R7540	Bot	D	16	0402R	Chipres 0W06 47k F 200ppm 0402	47k	~
R7541	Bot	E	15	0402R	CHIPRES 0W06 1K2 F 250PPM 0402	1k2	~
R7542	Bot	E	17	0402R	Chipres 0W06 jumper 0402	0R	~
R7543	Bot	E	17	0402R	Resistor 5% 63mW	10k	~
R7544	Bot	D	16	0402R	Resistor 5% 63mW	10R	~
R7549	Bot	E	18	0402R	Chipres 0W06 jumper 0402	0R	~
R7571	Bot	E	15	0402R	CHIPRES 0W06 4K7 F 200PPM 0402	4k7	~
R7593	Top	K	22	0402R	Chipres 0W06 jumper 0402	0R	~
S4401	Top	L	22	BUTTON_EVPAA	SWITCH PB LIGHT EVPAA 15V 20MA	~	~
T6030	Bot	K	4	TRANS_LDB213	TRANSF BALUN 2400 +-100MHZ	~	~
T7500	Bot	F	14	TRANS_LDB15	TRANSF BALUN 2134 +-90MHZ 0805	~	~
T7501	Bot	G	12	TRANS_HHM1517A2	TRANSF BALUN 3800 +-550MHZ 0805	~	~
V2303	Bot	D	5	SOD323F	SCH DI 30V 2A SOD323F	~	~
V4400	Top	B	22	TRANS_SFH3710	SILICON PHOTOTRANSISTOR SF3710 SMT 2.1X1.4X	~	~

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Item	Side	Grid ref.		Type	Description and value		
V4401	Bot	C	3	SC_76	DI ZEN 100V 6% 200MW SOD323	~	~
V4402	Bot	C	4	SC_76	DI ZEN 100V 6% 200MW SOD323	~	~
V4403	Bot	H	13	VMT3	TR 2SC5658QRS N 50V 0A1 0W15 VMT3	~	~
V4404	Bot	J	2	CIM_138M7_T	IRDA 1.152 MBITS/S WITH LIFT PWB	~	~
V4405	Top	B	22	LED_CL191	LED CL-191WB-D-T WHITE 0` 115MCD 0603	~	~
V4406	Top	C	22	VMT3	TR 2SC5658QRS N 50V 0A1 0W15 VMT3	~	~
W6300	Bot	J	1	ANT_RENM05041	BT/WLAN 1.0 TP ANTENNA RELEASE	~	~
X1550	Bot	L	21	SOCKET_SMIA_85	SOCKET SMIA85 LOW HEIGHT	~	~
X2001	Bot	F	1	SYSCON_MQ202_NK_14R3	SM SYSTEM CONNECTOR 14POL	~	~
X2060	Top	H	1	TRACEABILITY_PAD	MODULE ID COMPONENT 2.8X1.8X0.3	~	~
X2070	Bot	K	18	CON_BATT_2_1705771_5	CONN BATT 3.5V 2A P3.7 H4.5MM	~	~
X2700	Bot	C	15	SIM_CONN_M_SK_200300383	SM SIM CONN 2X3POL P2.54 H4.6	~	~
X4400	Top	E	22	JST_R_JAVK_G_1_R3	SM CONN 2X12F P0.4 30V .3A PWB/PWB	~	~
X4501	Bot	B	17	SMK_4309_B_B_6P_V2	SM CONN 6P SPR P1.3 50V BTOB	~	~
X5200	Bot	L	15	CONN_SMC_MICRO_SD	CONN SMC MICRO-SD 8POL P1.1	~	~
X6300	Bot	L	2	COAX_MM8430	CONN SM COAX+ SW F 50R 250V 6GHZ	~	~
X7500	Bot	B	23	SPRING_WN9149_N10	C-SPRING ANTENNA active	~	~
X7501	Bot	C	23	SPRING_WN9149_N10	C-SPRING ANTENNA active	~	~
X7504	Bot	M	23	SPRING_WN9149_N10	C-SPRING ANTENNA active	~	~
X7505	Bot	L	23	SPRING_WN9149_N10	C-SPRING ANTENNA active	~	~

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Item	Side	Grid ref.		Type	Description and value		
X7507	Bot	J	23	SPRING_WN9149_N10	C-SPRING ANTENNA active	~	~
Z2000	Bot	F	3	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/100MHz	~
Z2001	Bot	F	3	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/100MHz	~
Z2003	Bot	F	3	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/100MHz	~
Z4402	Bot	F	18	uBGA25_2.47X2.47	ASIP 10-CH ESD EMI FILTER BGA25	~	~
Z4403	Bot	G	18	uBGA25_2.47X2.47	ASIP 10-CH ESD EMI FILTER BGA25	~	~
Z4500	Bot	M	13	uBGA25_2.47X2.47	ASIP 10-CH ESD EMI FILTER BGA25	~	~
Z4501	Bot	M	13	uBGA25_2.47X2.47	ASIP 10-CH ESD EMI FILTER BGA25	~	~
Z5200	Bot	I	17	FLIP_CHIP_16_2.01X2.02_H0.715	MMC ASP HIGH SPEED BGA16	~	~
Z6300	Bot	L	3	LFB2H2G45SGFB868	CER FILT 2450+-50MHZ 2.5X2.0	2450 MHz	~
Z7500	Bot	G	15	MODULE_SP_LMZ_137_H1.35	TX SAW MODULE GSM 850/900MHZ	850/900MHz	~
Z7520	Bot	F	16	FILTER_LFTC10N	CER FILT LFL181699TC1 2400-2483MHZ 1.6	2400-2483 MHz	~
Z7540	Bot	D	17	P_TC3N_12_1_AGI	DUPL BAW 1920-1980/2110-2170MHZ 3.8X3.8	1920-1980/2110-2170 MHZ	~

Component parts list (1zh_08b)

Note: For Nokia product codes, please refer to the latest Service Bulletins on the Partner Website (PWS). To ensure you are always using the latest codes, please check the PWS on a daily basis.

Item	Side	Grid ref.		Type	Description and value		
A2200	Bot	D	7	SHIELD_PWB_CAN_WB	SHIELD PWB CAN WB	~	~
A2801	Bot	C	13	SHIELD_PWB_CAN_RAP	SHIELD PWB CAN RAP	~	~

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Item	Side	Grid ref.		Type	Description and value		
A4801	Bot	K	12	SHIELD_040_017 960	PWB CAN COMBO	~	~
A4802	Bot	L	7	SHIELD_PWB_CAN _APE	SHIELD PWB CAN APE	~	~
A6001	Bot	L	4	SHIELD_PWB_CAN _BT	SHIELD PWB CAN BT	~	~
A6302	Bot	H	5	SHIELD_040_032 439	PWB_CAN_WLAN	~	~
A7000	Bot	I	15	SHIELD_040_037 190	PWB_CAN_GE	~	~
A7503	Bot	D	16	SHIELD_PWB_CAN _WCDMA	SHIELD PWB CAN WCDMA	~	~
A7506	Bot	G	16	SHIELD_PWB_CAN _PA	SHIELD PWB CAN Pa	~	~
A7507	Bot	G	13	SHIELD_040_032 484	PWB_CAN_PIHI_N	~	~
A7508	Top	K	22	SHIELD_040_032 485	PWB_CAN_ANT	~	~
B2200	Bot	E	8	CRYSTAL_FC_135	CRYSTAL 32.768KHZ +-20PPM 12.5PF	32.768kH z	~
C1553	Bot	K	20	0402C	Chipcap 5% NP0	27p	50V
C1554	Bot	L	20	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C1555	Bot	K	22	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C1556	Bot	L	22	0402C	Chipcap 5% NP0	27p	50V
C1557	Bot	J	16	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C1558	Bot	I	15	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C1559	Bot	I	16	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C1560	Bot	J	15	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C1561	Bot	K	19	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C1562	Bot	J	20	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C1563	Bot	I	14	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V

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Item	Side	Grid ref.		Type	Description and value		
C1564	Bot	I	15	0603C	CHIPCAP X5R 10UF 6V3 0603	10u	4V
C1565	Bot	K	20	0402C	Chipcap X5R 10% 6.3V 0402	220n	6.3V
C1566	Bot	J	16	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C1567	Bot	K	19	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C1569	Bot	I	17	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C1570	Bot	J	17	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C1571	Bot	I	17	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C2000	Bot	D	4	0402C	Chipcap 5% NP0	27p	50V
C2001	Bot	D	4	0603C_H0.95	CHIPCAP X5R 470N K 25V 0603	470n	25V
C2005	Bot	F	3	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C2006	Bot	G	3	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C2071	Bot	M	18	TANT_C_6.2X3.4_H1.7	CHIPTCAP 150U M 10V 6X3.2X1.5	150u_10V	10V
C2101	Bot	C	17	0402C	Chipcap 5% NP0	68p	50V
C2102	Bot	C	17	0402C	Chipcap 5% NP0	68p	50V
C2103	Top	F	23	0402C	Chipcap 5% X7R	1n0	50V
C2104	Top	F	22	0402C	Chipcap 5% X7R	1n0	50V
C2105	Bot	C	17	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2106	Bot	C	9	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2107	Bot	C	8	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2108	Bot	B	9	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2109	Bot	B	9	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2110	Bot	B	9	0402C	Chipcap X7R 10% 50V 0402	1n0	50V

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Item	Side	Grid ref.		Type	Description and value		
C2201	Bot	D	7	0402C	CHIPCAP X5R 1U5 K 4V 0402	1u5	4V
C2205	Bot	D	9	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2211	Bot	C	8	0805C	CHIPCAP X5R 4U7 K 10V 0805	4u7	10V
C2213	Bot	E	7	0405_DUAL	CHIPCAP NETWORK X5R 2X1U5 K 6V3 0405	2x1u5	6.3V
C2215	Bot	D	7	0405_DUAL	CHIPCAP NETWORK X5R 2X1U5 K 6V3 0405	2x1u5	6.3V
C2216	Bot	E	7	0402C	CHIPCAP X5R 1U5 K 4V 0402	1u5	4V
C2217	Bot	C	9	0402C	CHIPCAP X5R 1U5 K 4V 0402	1u5	4V
C2220	Bot	C	8	0405_DUAL	CHIPCAP NETWORK X5R 2X1U5 K 6V3 0405	2x1u5	6.3V
C2222	Bot	C	7	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2225	Bot	C	7	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2226	Bot	D	7	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2227	Bot	D	7	0405_DUAL	CHIPCAP NETWORK X5R 2X1U5 K 6V3 0405	2x1u5	6.3V
C2228	Bot	D	7	0405_DUAL	CHIPCAP NETWORK X5R 2X1U5 K 6V3 0405	2x1u5	6.3V
C2231	Bot	C	9	0805C	CHIPCAP X5R 10U M 6V3 0805	10U	6V3
C2232	Bot	C	7	0405_DUAL	CHIPCAP NETWORK X5R 2X1U5 K 6V3 0405	2x1u5	6.3V
C2235	Bot	D	9	0603C	CHIPCAP X5R 2U2 K 6V3 0603	2u2	6V3
C2236	Bot	E	9	0603C	CHIPCAP X5R 2U2 K 6V3 0603	2u2	6V3
C2237	Bot	D	6	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2238	Bot	E	9	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2239	Bot	E	14	0402C	Chipcap X7R 10% 50V 0402	1n0	50V

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Item	Side	Grid ref.		Type	Description and value		
C2300	Bot	C	5	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C2301	Bot	C	5	0805C	CHIPCAP X5R 22U M 6V3 0805	22u	6V3
C2302	Bot	C	6	0805C	CHIPCAP X5R 22U M 6V3 0805	22u	6V3
C2303	Bot	E	5	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2304	Bot	D	6	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C2307	Bot	E	4	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2309	Bot	C	6	0805C	CHIPCAP X5R 22U M 6V3 0805	22u	6V3
C2312	Bot	E	5	0405_DUAL	CHIPCAP NETWORK X5R 2X1U5 K 6V3 0405	2x1u5	6.3V
C2314	Bot	D	4	0805C	CHIPCAP X5R 4U7 M 25V 0805	4u7	25V
C2315	Bot	C	5	0805C	CHIPCAP X5R 4U7 M 25V 0805	4u7	25V
C2700	Bot	C	17	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C2800	Bot	B	13	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C2801	Bot	E	13	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C2802	Bot	E	13	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C2803	Bot	E	12	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C2804	Bot	B	11	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C2805	Bot	C	14	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C2806	Bot	C	11	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C2807	Bot	B	12	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C2808	Bot	B	14	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V

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Item	Side	Grid ref.		Type	Description and value		
C2809	Bot	E	13	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C2810	Bot	D	14	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C2811	Bot	E	13	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C2812	Bot	C	14	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C2813	Bot	B	12	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C2814	Bot	B	14	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C2815	Bot	C	11	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C2816	Bot	D	11	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C2817	Bot	B	11	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C2818	Bot	B	14	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C2819	Bot	B	13	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C2820	Bot	B	11	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C2821	Bot	D	11	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C2822	Bot	E	12	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C4200	Bot	C	11	0805C	CHIPCAP X5R 22U M 6V3 0805	22u	6V3
C4201	Bot	C	9	0805C	CHIPCAP X5R 22U M 6V3 0805	22u	6V3
C4202	Bot	B	9	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C4400	Bot	G	18	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C4401	Bot	F	18	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C4402	Bot	G	17	0402C	Chipcap 5% NP0	27p	50V
C4403	Bot	F	17	0402C	Chipcap 5% NP0	27p	50V
C4404	Bot	A	5	0402C	Chipcap 5% NP0	68p	50V

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Item	Side	Grid ref.		Type	Description and value		
C4405	Bot	A	5	0402C	CHIPCAP X7R 15N K 16V 0402	15n	16V
C4406	Bot	C	3	0402C	CHIPCAP X5R 1U K 6V3 0402	1u0	6.3V
C4409	Bot	K	1	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C4410	Bot	I	2	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C4414	Bot	A	3	0603C	CHIPCAP X5R 1U K 16V 0603	1u0	16V
C4415	Top	C	23	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C4416	Bot	I	3	0402C	Chipcap 5% NP0	27p	50V
C4420	Top	C	23	0402C	Chipcap 5% NP0	27p	50V
C4421	Top	C	22	0402C	Chipcap 5% NP0	27p	50V
C4800	Bot	K	11	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C4801	Bot	I	12	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C4802	Bot	J	13	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C4803	Bot	I	12	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C4804	Bot	K	11	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C4805	Bot	I	11	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C4806	Bot	L	13	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C4807	Bot	L	11	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C4808	Bot	I	11	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C4809	Bot	K	13	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C4810	Bot	I	13	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C4811	Bot	L	11	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C4812	Bot	L	12	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V

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Item	Side	Grid ref.		Type	Description and value		
C4813	Bot	J	13	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C5000	Bot	K	8	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C5001	Bot	M	8	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C5002	Bot	L	8	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C5003	Bot	J	7	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C5004	Bot	M	8	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C5005	Bot	M	7	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C5006	Bot	J	8	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C5200	Bot	J	15	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C5201	Bot	I	16	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C5202	Bot	I	16	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C5203	Bot	I	15	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C5204	Bot	I	15	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C6030	Bot	L	4	0402C	Chipcap 5% NP0	100p	50V
C6031	Bot	K	5	0402C	Chipcap 5% NP0	15p	50V
C6033	Bot	M	4	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C6036	Bot	K	5	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C6037	Bot	L	5	0402C	CHIPCAP X5R 1U K 6V3 0402	1u0	6.3V
C6038	Bot	M	5	0402C	CHIPCAP X5R 1U K 6V3 0402	1u0	6.3V
C6039	Bot	L	4	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C6040	Bot	L	4	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V

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Item	Side	Grid ref.		Type	Description and value		
C6041	Bot	M	4	0402C	CHIPCAP X5R 0U47 K 6.3V 0402	0u47	6V3
C6042	Bot	L	5	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C6043	Bot	L	5	0402C	CHIPCAP X5R 0U47 K 6.3V 0402	0u47	6V3
C6044	Bot	K	4	0402C	CHIPCAP X5R 1U K 6V3 0402	1u0	6.3V
C6045	Bot	K	4	0402C	CHIPCAP X5R 1U K 6V3 0402	1u0	6.3V
C6051	Bot	K	4	0402C	Chipcap 5% NP0	10p	50V
C6300	Bot	G	4	0805C	CHIPCAP X5R 22U M 6V3 0805	22u	6V3
C6301	Bot	G	5	0402C	CHIPCAP X5R 1U K 6V3 0402	1u0	6.3V
C6302	Bot	G	5	0402C	CHIPCAP X5R 1U K 6V3 0402	1u0	6.3V
C6303	Bot	G	4	0603C	CHIPCAP X5R 2U2 K 6V3 0603	2u2	6V3
C6307	Bot	I	5	0402C	CHIPCAP X5R 1U K 6V3 0402	1u0	6.3V
C6308	Bot	I	4	0402C	Chipcap +-0.25pF NP0	6p8	50V
C6329	Bot	K	3	0402C	Chipcap +-0.25pF NP0	6p8	50V
C6330	Bot	L	3	0603C	CHIPCAP X5R 2U2 K 6V3 0603	2u2	6V3
C6335	Bot	J	3	0402C	CHIPCAP NP0 220P J 25V 0402	220p	25V
C6338	Bot	K	3	0402C	Chipcap 5% NP0	47p	50V
C6348	Bot	G	5	0402C	CHIPCAP X5R 1U K 6V3 0402	1u0	6.3V
C6396	Bot	K	4	0402C	Chipcap +-0.25pF NP0	6p8	50V
C6397	Bot	K	4	0402C	Chipcap +-0.25pF NP0	6p8	50V
C6398	Bot	J	4	0402C	Chipcap +-0.25pF NP0	6p8	50V
C6399	Bot	J	4	0402C	Chipcap +-0.25pF NP0	6p8	50V
C6400	Bot	H	4	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C6401	Bot	H	6	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C6402	Bot	I	5	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V

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Item	Side	Grid ref.		Type	Description and value		
C6403	Bot	I	4	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C6410	Bot	I	1	0402C	Chipcap +-0.25pF NP0	1p5	50V
C7500	Bot	F	14	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C7501	Bot	G	12	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C7502	Bot	H	12	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C7503	Bot	F	14	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C7504	Bot	G	11	0402C	Chipcap 5% X7R	3n9	50V
C7505	Bot	G	12	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C7506	Bot	F	12	0402C	Chipcap 5% NP0	27p	50V
C7507	Bot	F	15	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C7508	Bot	F	12	0402C	Chipcap 5% NP0	10p	50V
C7509	Bot	F	12	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C7510	Bot	G	11	0402C	CHPCAP NP0 470P J 50V 0402	470p	50V
C7511	Bot	F	12	0402C	CHIPCAP X7R 33N K 10V 0402	33n	10V
C7512	Bot	G	11	0603C	CHIPCAP NP0 2N2 G 16V 0603	2n2	16V
C7514	Bot	F	14	0402C	Chipcap +-0.25pF NP0	2p2	50V
C7515	Bot	G	14	0402C	Chipcap +-0.25pF NP0	2p7	50V
C7516	Bot	F	11	0402C	CHIPCAP NP0 0P5 C 50V 0402	0p5	50V
C7518	Bot	E	13	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C7521	Bot	H	17	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C7527	Bot	F	15	0402C	Chipcap +-0.25pF NP0	1p2	50V
C7565	Bot	F	14	0402C	Chipcap 5% NP0	12p	50V
C7566	Bot	E	13	0402C	Chipcap 5% NP0	12p	50V
C7591	Top	K	22	0402C	Chipcap 5% NP0	100p	50V
C7593	Top	J	22	0402C	Chipcap +-0.25pF NP0	8p2	50V

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Item	Side	Grid ref.		Type	Description and value		
C7594	Top	J	23	0402C	Chipcap 5% NP0	12p	50V
C7595	Top	K	22	0402C	Chipcap 5% NP0	12p	50V
C7597	Top	J	22	0402C	Chipcap +-0.25pF NP0	2p2	50V
D1550	Bot	J	16	TFBGA84	HW ACCELERATOR STV0984N	~	~
D2800	Bot	C	13	VFBGA343	RAP3GS V2.0E-PA VFBGA	~	~
D2801	Bot	C	13	FBGA128_EMPTY	COMBO 128M NOR +128M DDR DRAM FBGA128	8Mx16/8 Mx16	~
D4800	Bot	K	12	uBGA_289	HELEN3 PS2.0 N3 F761909 C27 UBGA289	~	~
D5000	Bot	L	7	FBGA133_10.1X13.1_H1.1	COMBO 512 DDR + 1G NAND FBGA133 PBFR	32Mx16/128Mx8	~
D6030	Bot	J	4	XBGA_N5_H0.625	OR-GATE 2INPUT 74LVC1G32YZTR WCSP-5	~	~
F2000	Bot	C	4	0603_FUSE_AVX2 MATS	SM FUSE F 2.0A 32V	2A	~
G2200	Bot	E	10	BATTER_EECEP	RTC BACUP CAPAC 311 SIZE FOR 2.6V 4UAH	2.6V	~
G6030	Bot	K	5	VCTCXO_3.4X2.7_4P2_H1.0	TCXO 38.4MHZ +-10PPM 2.78V	38.4MHz	~
G7500	Bot	H	12	NKG3176B_H1.0	VCTCXO 38.4MHZ 2.5V 2MA	38.4MHz	~
G7501	Bot	F	12	VCO_FDK_WB002	VCO 3296-3980MHZ 2.7V 20MA EGSM	3296-3980MHz	~
L1550	Bot	K	19	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/ 100MHz	~
L1552	Bot	L	22	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/ 100MHz	~
L1553	Bot	I	14	INDUCTOR_MDT2520	INDUCT ML CHIP PWR 1UH0 0R13 1A5	1uH	~
L2000	Bot	C	3	0603_BLM	FERR.BEAD 220R/100M 2A 0R05 0603	220R/ 100MHz	~
L2001	Bot	G	3	0405_2_H1.0	CHIP BEAD ARRAY 2X1000R 0405	2x1000R/ 100MHz	~
L2002	Bot	G	2	0405_2_H1.0	CHIP BEAD ARRAY 2X1000R 0405	2x1000R/ 100MHz	~
L2003	Bot	G	3	0405_2_H1.0	CHIP BEAD ARRAY 2X1000R 0405	2x1000R/ 100MHz	~

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Item	Side	Grid ref.		Type	Description and value		
L2100	Top	F	22	0405_2_H1.0	CHIP BEAD ARRAY 2X1000R 0405	2x1000R/ 100MHz	~
L2101	Bot	C	9	0603_BLM	FERR.BEAD 220R/100M 2A 0R05 0603	220R/ 100MHz	~
L2102	Bot	H	21	COIL_0603CS	CHIP COIL 56N J Q38/250MHZ 0603	56nH	~
L2103	Bot	H	21	COIL_0603CS	CHIP COIL 56N J Q38/250MHZ 0603	56nH	~
L2104	Bot	C	8	0603_BLM	FERR.BEAD 220R/100M 2A 0R05 0603	220R/ 100MHz	~
L2105	Bot	B	9	0402L_XL	FERRITE BEAD 220R 0R45 0.3A 0402	220R/ 100MHz	~
L2106	Bot	B	9	0402L_XL	FERRITE BEAD 220R 0R45 0.3A 0402	220R/ 100MHz	~
L2202	Bot	C	7	0603_BLM	FERR.BEAD 220R/100M 2A 0R05 0603	220R/ 100MHz	~
L2205	Bot	C	9	0603_BLM	FERR.BEAD 220R/100M 2A 0R05 0603	220R/ 100MHz	~
L2301	Bot	C	5	0603_BLM	FERR.BEAD 220R/100M 2A 0R05 0603	220R/ 100MHz	~
L2302	Bot	C	6	CHOKE_SER400	CHOKE 10U 0.8A 0R24 4X4X1.8	10uH	~
L2304	Bot	C	5	CHOKE_SER300_H 1.5	CHOKE 22U M 0R7 0.35A 3.0x3.0x1.5	22uH	~
L4200	Bot	B	10	CHOKE_SER400	CHOKE 10U 0.8A 0R24 4X4X1.8	10uH	~
L4201	Bot	B	9	0603_BLM	FERR.BEAD 220R/100M 2A 0R05 0603	220R/ 100MHz	~
L4400	Bot	G	18	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/ 100MHz	~
L4401	Bot	F	18	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/ 100MHz	~
L4402	Bot	B	3	CHOKE_ELT3KN15 2C	COIL 0.47MH 50MA 3.3X3.4X1.4MM	0.47MH	~
L5200	Bot	J	14	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/ 100MHz	~
L6030	Bot	K	5	0402L	CHIP COIL 22N J Q28/800M 0402	22nH	~
L6031	Bot	L	4	0402L	CHIP COIL 2N2+-0N3 Q30/800M 0402	2n2H	~

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Item	Side	Grid ref.		Type	Description and value		
L6302	Bot	J	1	FERRITE_LQP10	CHIP COIL 1N0 +-0N1 Q50/1GHZ 0402	1nH	~
L7500	Bot	F	13	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/ 100MHz	~
L7520	Bot	H	16	FERRITE_FBMJ1608	FERRITE BEAD 0R01 28R/100MHZ 0603	28R/ 100MHz	~
L7527	Bot	F	16	0402L	CHIP COIL 2N7+-0N3 Q29/800M 0402	2n7H	~
L7591	Top	J	22	0402L	CHIP COIL 3N3 +-0N3 Q28/800M 0402	3n3H	~
M2100	Bot	B	7	VIBRA_M_KHN4NX1RA	SMD VIBRA MOTOR 1.3V 80MA 9000RPM	~	~
N1551	Bot	J	19	USMD5_1.47X1.04_H0.675	VREG LP3985ITLX-2.8 NOPB USMD5	~	3V
N1552	Bot	I	14	USMD5_1.518X1.137	DC/DC CONV 1.8V 600MA 3MHZ WLCSP5	~	~
N2200	Bot	D	8	TFBGA_105	AVILMA 1.05C BB MODULE TFBGA105	~	~
N2300	Bot	D	5	TFBGA64_H1.2	BETTY V2.1 & V2.2 LFA TFBGA64	~	~
N2301	Bot	C	5	USMD8_1.69X1.69	WHITE LED DRIVER 4LEDS 500MW 8BUMP USMD8	~	~
N4200	Bot	D	10	USMD_10_2.458X1.899	DC/DC CONV LM3661-1.40V/1.05V NOPB	~	~
N4402	Bot	B	4	MSOP_10	EL DRIVER D381B 2-7V MSOP-10	~	~
N4403	Bot	I	14	SC70_5	1XOP AMP 2.7-5.5V LMV321 SC70-5	~	~
N4404	Bot	B	3	SOT_666	TRX2+RX4 PEMD9 N&P 10K/47K 0W12 SOT666	~	~
N5200	Bot	I	16	USMD16_2.03X2.03	VREG & LEVEL SHIFT LP3928 USMD16	~	2.8V
N5201	Bot	I	15	USMD16_2.03X2.03	VREG & LEVEL SHIFT LP3928 USMD16	~	2.8V
N6030	Bot	L	5	uBGA63_4.6X4.6	BRF6150	~	~
N6031	Bot	K	4	FC_4_0.99X0.99	LI VREG TK63128B 2.8V WLCSP4	~	2.8V
N6300	Bot	H	5	LFBGA240	WLAN MCM STLC4550 LFBGA240	~	~

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Item	Side	Grid ref.		Type	Description and value		
N6301	Bot	K	3	RF5924	WLAN RF5924 ES3.5	~	~
N7500	Bot	G	13	TFBGA_188_H1.4	PIHI N2.0 RF SYSTEM MODULE	~	~
N7520	Bot	G	16	RF9282E3.6_4CM	PA RF9282E6.5 GSM/ EDGE 850/900/1800/1900	~	~
N7590	Top	K	22	SC70_6_FAIR	HIGH POWER SPDT RF SW SC70	~	~
R1500	Bot	L	13	0402R	CHIPRES 0W06 10K F 0402	10k	~
R1550	Bot	L	20	0402R	Resistor 5% 63mW	4k7	~
R1551	Bot	L	20	0402R	Resistor 5% 63mW	4k7	~
R1555	Bot	K	13	0402R	Resistor 5% 63mW	100R	~
R1556	Bot	K	13	0402R	Resistor 5% 63mW	100R	~
R1567	Bot	I	17	0402R	Resistor 5% 63mW	4k7	~
R1568	Bot	J	17	0402R	Chipres 0W06 jumper 0402	0R	~
R1573	Bot	I	15	0402R	Resistor 5% 63mW	4k7	~
R1574	Bot	J	15	0402R	Resistor 5% 63mW	4k7	~
R2000	Bot	G	3	0402R	Resistor 5% 63mW	10R	~
R2001	Bot	F	3	0402R	Resistor 5% 63mW	10R	~
R2002	Bot	G	2	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V	~
R2003	Bot	F	2	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V	~
R2004	Bot	E	4	0402R	Resistor 5% 63mW	100R	~
R2006	Bot	G	3	BGA11	ASIP 4 LINES AUDIO FILTER BGA11	~	~
R2007	Bot	F	2	uBGA11_1.6X2.1 5	ASIP SILIC USB OTG / ESD BGA11	~	~
R2010	Bot	F	2	0402R	Resistor 5% 63mW	220k	~
R2015	Bot	D	4	BGA_4	ASIP TVS BGA4	~	~
R2070	Bot	K	17	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V	~
R2071	Bot	C	7	0402_NTH5	NTC RES 47K J B=4050 +-3% 0402	47k	~
R2104	Top	F	22	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V	~

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Item	Side	Grid ref.		Type	Description and value		
R2105	Top	F	23	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V	~
R2106	Bot	C	17	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V	~
R2107	Bot	C	17	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V	~
R2200	Bot	D	9	0402R	Resistor 5% 63mW	1k0	~
R2201	Bot	D	9	0402R	Chipres 0W06 jumper 0402	0R	~
R2302	Bot	D	5	0402R	Resistor 5% 63mW	100R	~
R2303	Bot	D	5	0402R	Resistor 5% 63mW	33R	~
R2800	Bot	B	13	0402R	Resistor 5% 63mW	10R	~
R2801	Bot	C	11	0402R	Resistor 5% 63mW	4k7	~
R2802	Bot	B	12	0402R	Resistor 5% 63mW	4k7	~
R2803	Bot	B	13	0402R	Resistor 5% 63mW	4k7	~
R4400	Top	C	22	0402R	Resistor 5% 63mW	470k	~
R4401	Top	B	22	0402R	Resistor 5% 63mW	100k	~
R4402	Top	C	22	0402R	Resistor 5% 63mW	470k	~
R4403	Top	C	22	0402_NTH5	NTC RES 47K J B=4050 +-3% 0402	47k	~
R4404	Bot	A	3	0402R	Chipres 0W06 jumper 0402	0R	~
R4406	Top	L	23	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V	~
R4407	Bot	I	13	0402R	Resistor 5% 63mW	18R	~
R4408	Bot	C	3	0402R	Chipres 0W06 5% 0402	3M3	~
R4409	Bot	I	13	0402R	Resistor 5% 63mW	33R	~
R4410	Bot	H	14	0402R	Resistor 5% 63mW	1k0	~
R4411	Bot	B	5	0402R	Resistor 5% 63mW	82k	~
R4412	Top	B	22	0402R	Resistor 5% 63mW	680R	~
R4413	Top	C	22	0402R	Resistor 5% 63mW	1k0	~
R4414	Bot	B	2	0402R	Resistor 5% 63mW	100k	~
R4423	Bot	K	1	0805R_THERM1	CHIPRES 0W125 4R7 J 0805	4R7	~
R4506	Bot	B	17	0402R	Chipres 0W06 jumper 0402	0R	~

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Item	Side	Grid ref.		Type	Description and value		
R4507	Bot	B	17	0402R	Chipres 0W06 jumper 0402	0R	~
R4508	Bot	B	17	0402R	Chipres 0W06 jumper 0402	0R	~
R4509	Bot	B	16	0402R	Chipres 0W06 jumper 0402	0R	~
R4800	Bot	K	11	0402R	Resistor 5% 63mW	10R	~
R4801	Bot	H	6	0402R	Resistor 5% 63mW	47R	~
R4802	Bot	H	6	0402R	Resistor 5% 63mW	47R	~
R4809	Bot	I	13	0402R	Resistor 5% 63mW	1k0	~
R5200	Bot	I	17	0402R	Resistor 5% 63mW	680R	~
R5201	Bot	I	17	0402R	Resistor 5% 63mW	1k2	~
R5202	Bot	J	17	0402R	Resistor 5% 63mW	100k	~
R5203	Bot	J	14	0402R	Resistor 5% 63mW	100k	~
R5204	Bot	J	14	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V	~
R5205	Bot	J	17	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V	~
R6054	Bot	L	5	0402R	Resistor 5% 63mW	100k	~
R6055	Bot	J	5	0402R	Resistor 5% 63mW	100k	~
R6065	Bot	M	5	0402R	Resistor 5% 63mW	10k	~
R6300	Bot	I	5	0402R	CHIPRES 0W06 1M F 100PPM 0402	1M0	~
R6301	Bot	I	5	0402R	Resistor 5% 63mW	10k	~
R6304	Bot	I	5	0402R	Resistor 5% 63mW	100R	~
R7500	Bot	G	12	0402R	Resistor 5% 63mW	22k	~
R7501	Bot	F	15	0402R	Resistor 5% 63mW	4k7	~
R7503	Bot	G	12	0402R	CHIPRES 0W06 1K0 F 200PPM 0402	1k0	~
R7504	Bot	G	12	0402R	CHIPRES 0W06 8K2 F 0402	8k2	~
R7509	Bot	F	12	0402R	Chipres 0W06 5R6 J 0402	5R6	~
R7520	Bot	H	16	0402R	CHIPRES 0W06 27K F 0402	27k	~
R7593	Top	K	22	0402R	Chipres 0W06 jumper 0402	0R	~
S4401	Top	L	22	BUTTON_EVPAA	SWITCH PB LIGHT EVPAA 15V 20MA	~	~

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Item	Side	Grid ref.		Type	Description and value		
T6030	Bot	K	4	TRANS_LDB213	TRANSF BALUN 2400 +-100MHZ	~	~
T7501	Bot	G	12	TRANS_HHM1517 A2	TRANSF BALUN 3800 +-550MHZ 0805	~	~
V2303	Bot	D	5	SOD323F	SCH DI 30V 2A SOD323F	~	~
V4400	Top	B	22	TRANS_SFH3710	SILICON PHOTOTRANSISTOR SF3710 SMT 2.1X1.4X	~	~
V4401	Bot	C	3	SC_76	DI ZEN 100V 6% 200MW SOD323	~	~
V4402	Bot	C	4	SC_76	DI ZEN 100V 6% 200MW SOD323	~	~
V4403	Bot	H	13	VMT3	TR 2SC5658QRS N 50V 0A1 0W15 VMT3	~	~
V4404	Bot	J	2	CIM_138M7_T	IRDA 1.152 MBITS/S WITH LIFT PWB	~	~
V4405	Top	B	22	LED_CL191	LED CL-191WB-D-T WHITE 0` 115MCD 0603	~	~
V4406	Top	C	22	VMT3	TR 2SC5658QRS N 50V 0A1 0W15 VMT3	~	~
W6300	Bot	J	1	ANT_RENM05041	BT/WLAN 1.0 TP ANTENNA RELEASE	~	~
X1550	Bot	L	21	SOCKET_SMIA_85	SOCKET SMIA85 LOW HEIGHT	~	~
X2001	Bot	F	1	SYSCON_MQ202_ NK_14R3	SM SYSTEM CONNECTOR 14POL	~	~
X2060	Top	H	1	TRACEABILITY_PA D	MODULE ID COMPONENT 2.8X1.8X0.3	~	~
X2070	Bot	K	18	CON_BATT_2_170 5771_5	CONN BATT 3.5V 2A P3.7 H4.5MM	~	~
X2700	Bot	C	15	SIM_CONN_M_SK_ 200300383	SM SIM CONN 2X3POL P2.54 H4.6	~	~
X4400	Top	E	22	JST_R_JAVK_G_1_R 3	SM CONN 2X12F P0.4 30V .3A PWB/PWB	~	~
X4501	Bot	B	17	SMK_4309_B_B_6 P_V2	SM CONN 6P SPR P1.3 50V BTOB	~	~
X5200	Bot	L	15	CONN_SMC_MICRO _SD	CONN SMC MICRO-SD 8POL P1.1	~	~
X6300	Bot	L	2	COAX_MM8430	CONN SM COAX+ SW F 50R 250V 6GHZ	~	~

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Item	Side	Grid ref.		Type	Description and value		
X7504	Bot	M	23	SPRING_WN9149_N10	C-SPRING ANTENNA active	~	~
X7505	Bot	L	23	SPRING_WN9149_N10	C-SPRING ANTENNA active	~	~
X7507	Bot	J	23	SPRING_WN9149_N10	C-SPRING ANTENNA active	~	~
Z2000	Bot	F	3	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/ 100MHz	~
Z2001	Bot	F	3	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/ 100MHz	~
Z2003	Bot	F	3	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/ 100MHz	~
Z4402	Bot	F	18	uBGA25_2.47X2.47	ASIP 10-CH ESD EMI FILTER BGA25	~	~
Z4403	Bot	G	18	uBGA25_2.47X2.47	ASIP 10-CH ESD EMI FILTER BGA25	~	~
Z4500	Bot	M	13	uBGA25_2.47X2.47	ASIP 10-CH ESD EMI FILTER BGA25	~	~
Z4501	Bot	M	13	uBGA25_2.47X2.47	ASIP 10-CH ESD EMI FILTER BGA25	~	~
Z5200	Bot	I	17	FLIP_CHIP_16_2.01X2.02_H0.715	MMC ASP HIGH SPEED BGA16	~	~
Z6300	Bot	L	3	LFB2H2G45SGFB868	CER FILT 2450+-50MHZ 2.5X2.0	2450MHz	~
Z7500	Bot	G	15	MODULE_SP_LMZ_137_H1.35	TX SAW MODULE GSM 850/900MHZ	850/900 MHz	~
Z7520	Bot	F	16	FILTER_LFTC10N	CER FILT LFL181699TC1 2400-2483MHZ 1.6	2400-2483MHz	~

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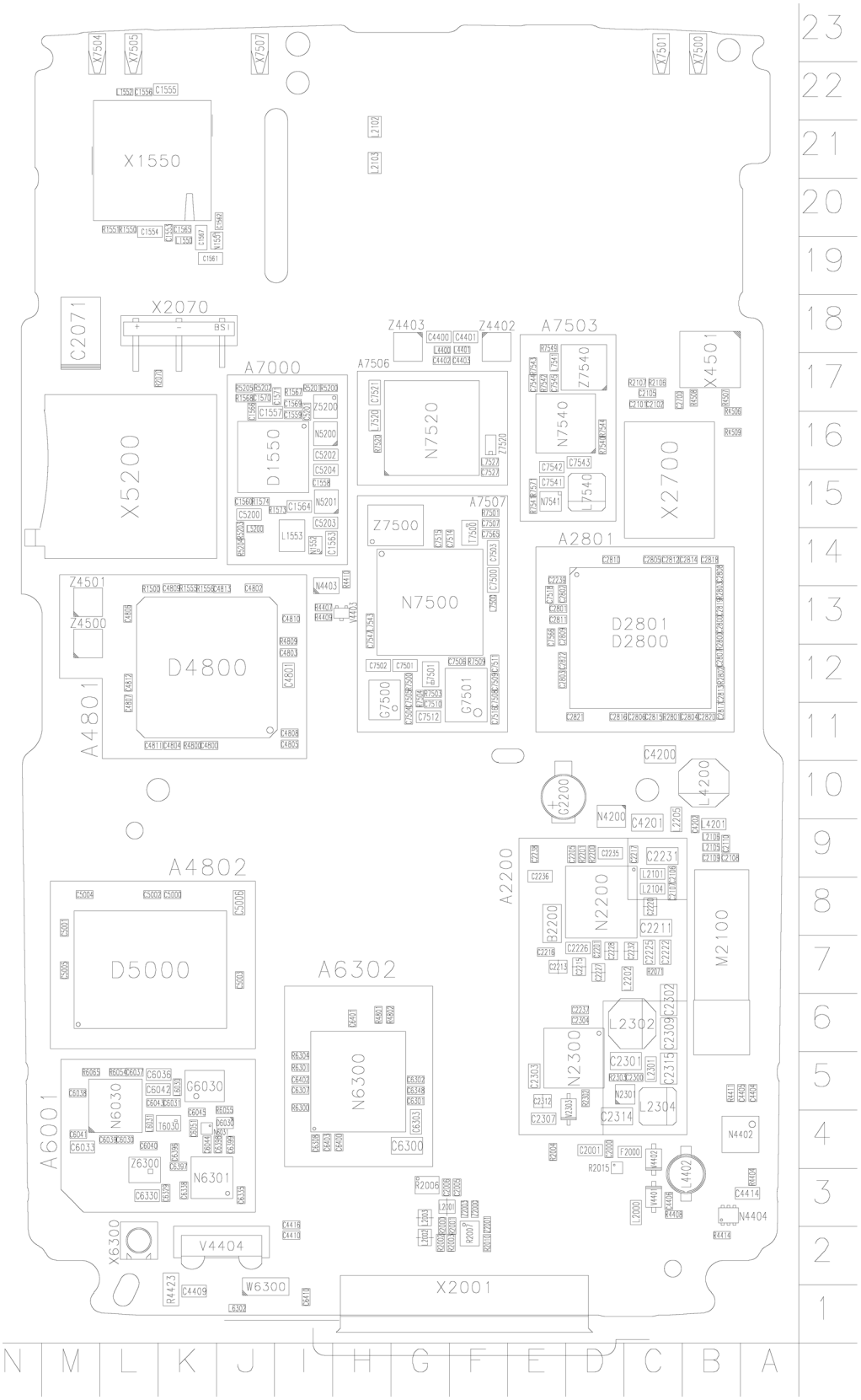
Component layouts 1zh_08a

Component layout - bottom (1zh_08a)



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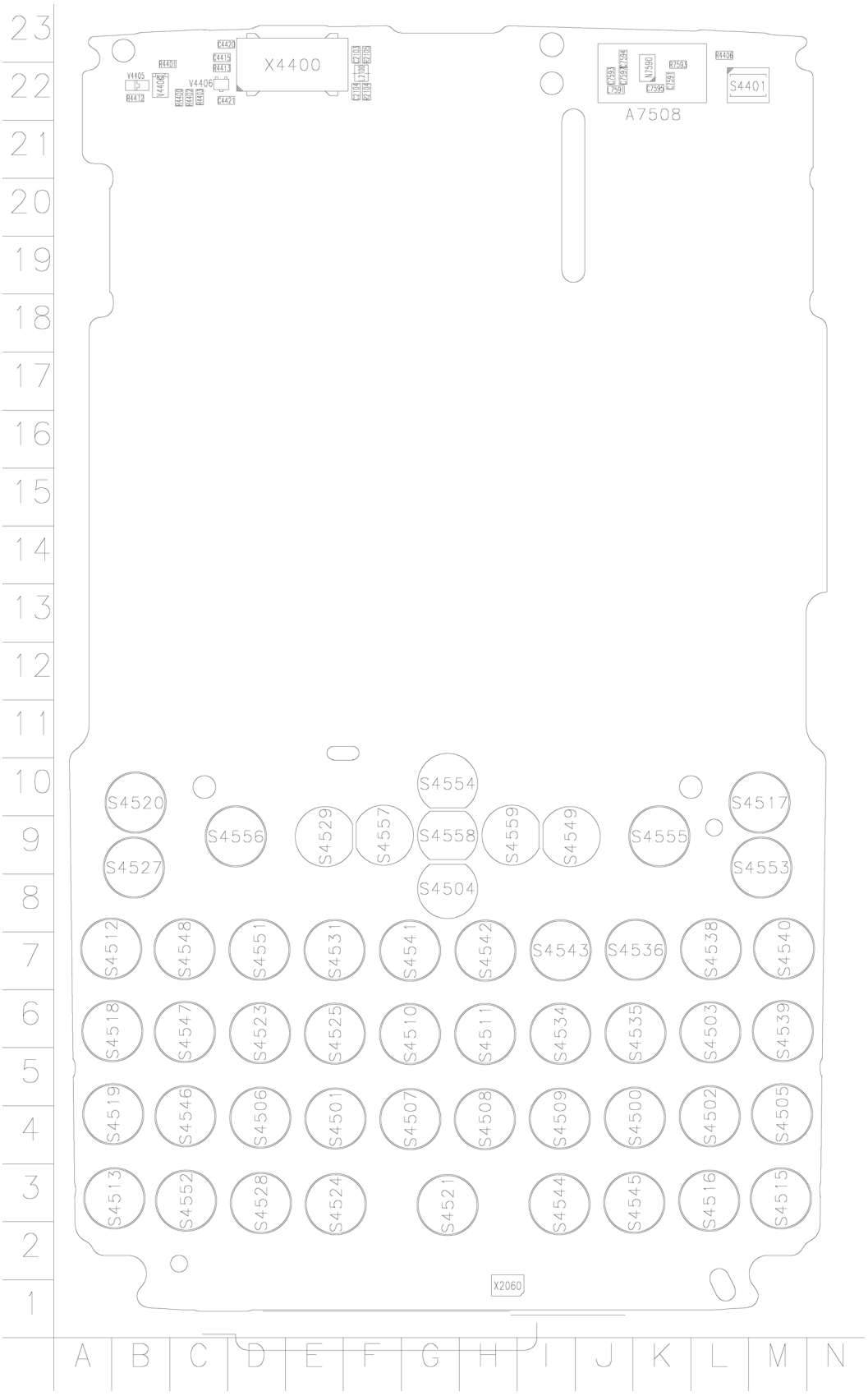
Component layout - top (1zh_08a)



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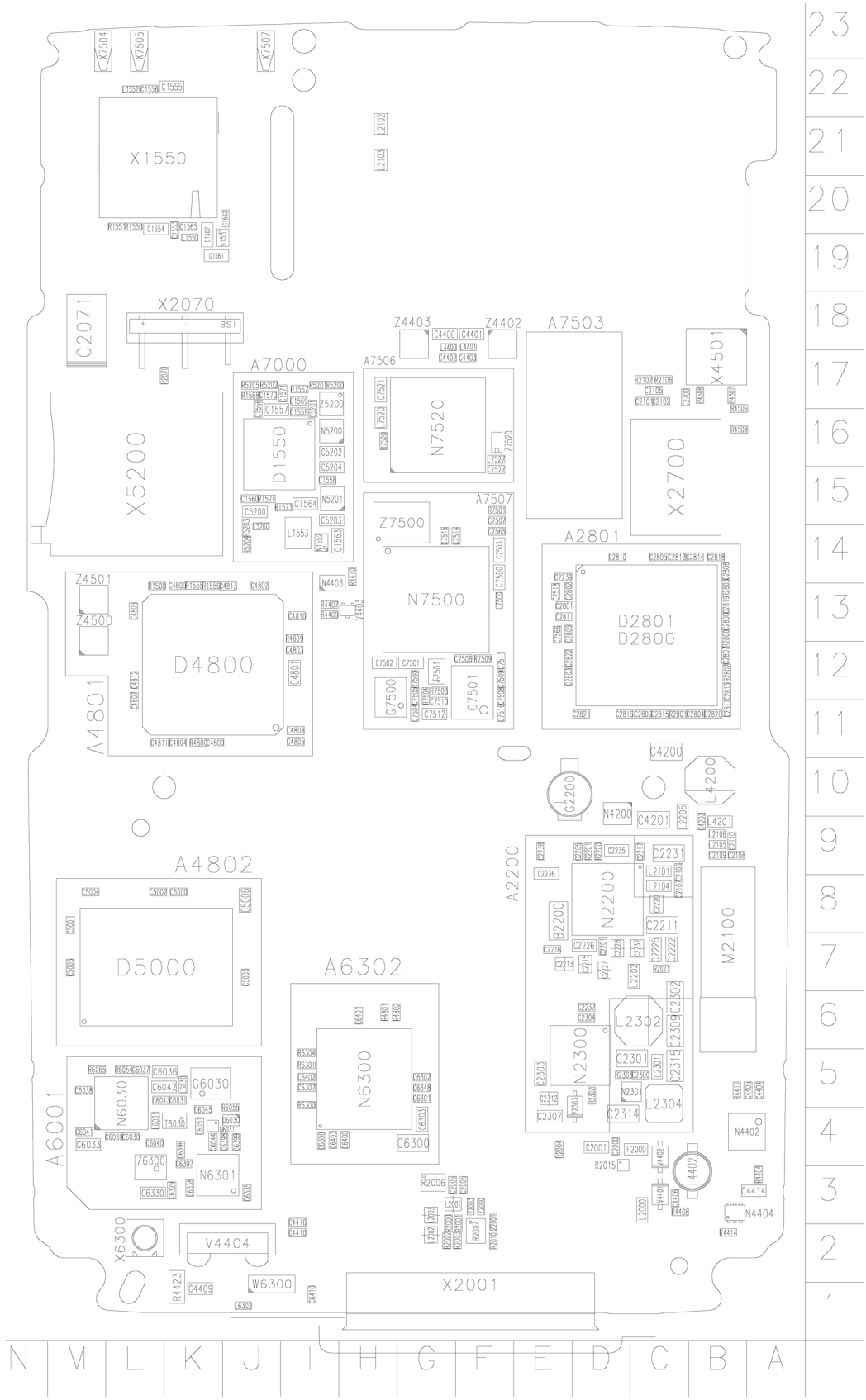
Component layouts 1zh_08b

Component layout - bottom (1zh_08b)



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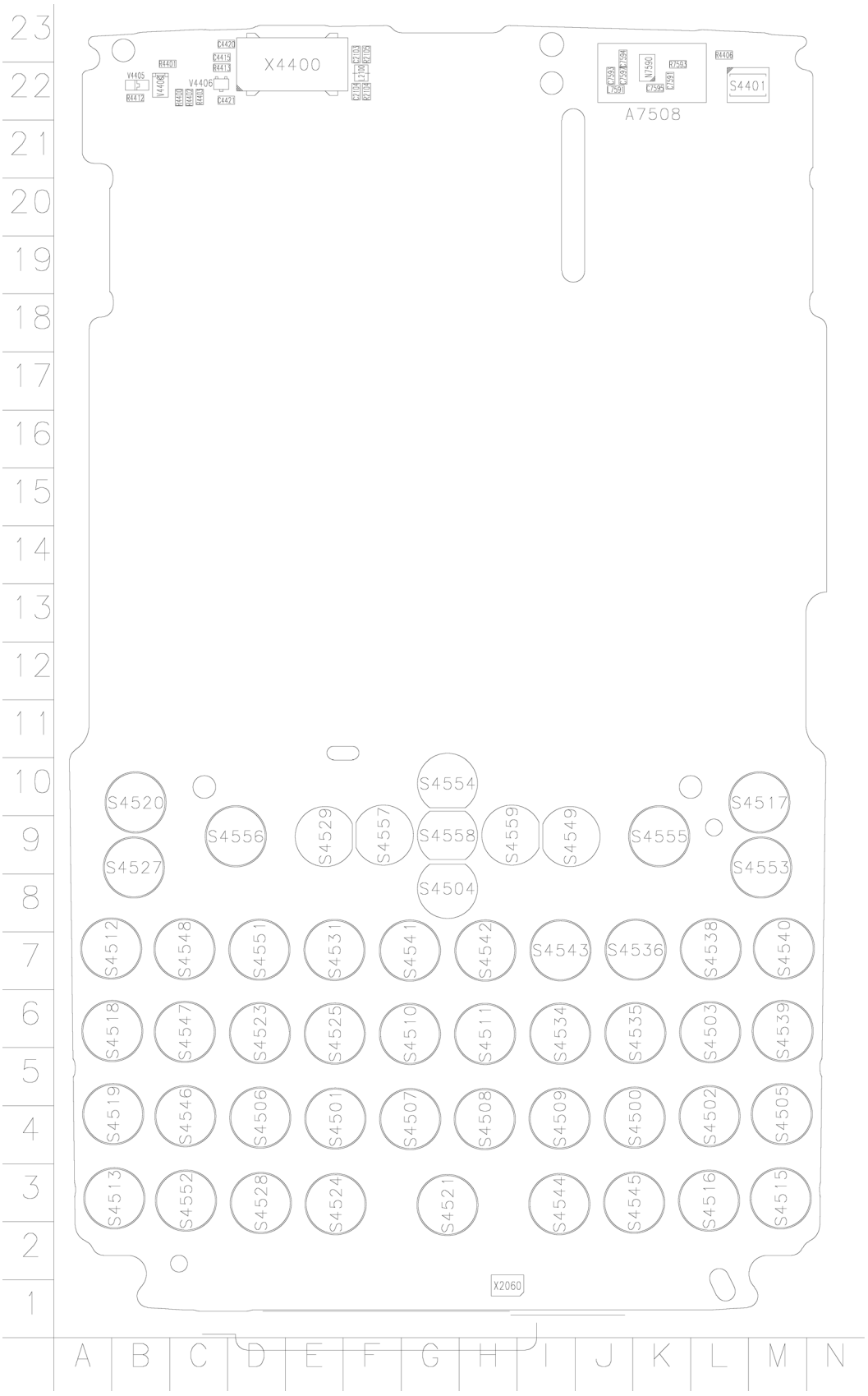
Component layout - top (1zh_08b)



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3 — Service Software Instructions

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Phoenix installation steps in brief

Prerequisites

Recommended hardware requirements:

- Computer processor: Pentium 700 MHz or higher
- RAM 256 MB
- Disk space 100-300 MB

Supported operating systems:

- *Windows 2000* Service Pack 3 or higher
- *Windows XP* Service Pack 1 or higher

Context

Phoenix is a service software for reprogramming, testing and tuning phones.

Phoenix installation contains:

- Service software support for all phone models included in the package
- Flash update package files for programming devices
- All needed drivers for:
  - PKD-1 (DK2) dongle
  - DKU-2 or CA-53 USB cable

    Note: Separate installation packages for flash update files and drivers are also available, but it is not necessary to use them unless there are updates between *Phoenix* service software releases. If separate update packages are used, they should be used after *Phoenix* and data packages have been installed.

The phone model specific data package includes all changing product specific data:

- Product software binary files
- Files for type label printing
- Validation file for the faultlog repair data reporting system
- All product specific configuration files for *Phoenix* software components

  Note: *Phoenix* and phone data packages should only be used as complete installation packages. Uninstallation should be made from the *Windows* Control Panel.

To use *Phoenix*, you need to:

Steps

1. Connect a PKD-1 (DK2) dongle to the computer parallel port.
2. Install *Phoenix*.
3. Install the phone-specific data package.
4. Configure users.

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5. Manage connection settings (depends on the tools you are using).

If you use FPS-10:	• Update FPS-10 software **Note:** There is no need to activate FPS-10. • Activate SX-4 smart card, if you need tuning and testing functions. **Note:** When FPS-10 is used only for product software updates, SX-4 smart card is not needed.

Results

Phoenix is ready to be used with FPS-10 flash prommer and other service tools.

Installing *Phoenix*

Prerequisites

- Check that a dongle is attached to the parallel port of your computer.
- Download the *Phoenix* installation package (for example, *phoenix_service_sw_2004_39_x_xx.exe*) to your computer (in *C:|TEMP*, for instance).
- Close all other programs.
- Depending on your operating system, administrator rights may be required to install *Phoenix*.
- If uninstalling or rebooting is needed at any point, you will be prompted by the InstallShield program.

Context

At some point during the installation procedure, you may get the following message:

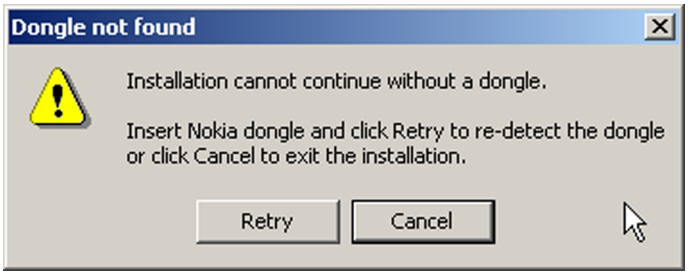

Figure 2 Dongle not found

This may be a result of a defective or too old PKD-1 dongle.

Check the COM/parallel ports used. After correcting the problem, you can restart the installation.

For more detailed information, please refer to *Phoenix* Help files.

Tip: Each feature in *Phoenix* has its own Help function, which can be activated while running the program. Press the **F1** key or the feature's **Help** button to activate a Help file.

Steps

1. To start the installation, run the application file (for example,*phoenix_service_sw_2004_39_x_xx.exe*).
2. In the *Welcome* dialogue, click **Next**.

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3. Read the disclaimer text carefully and click **Yes**.

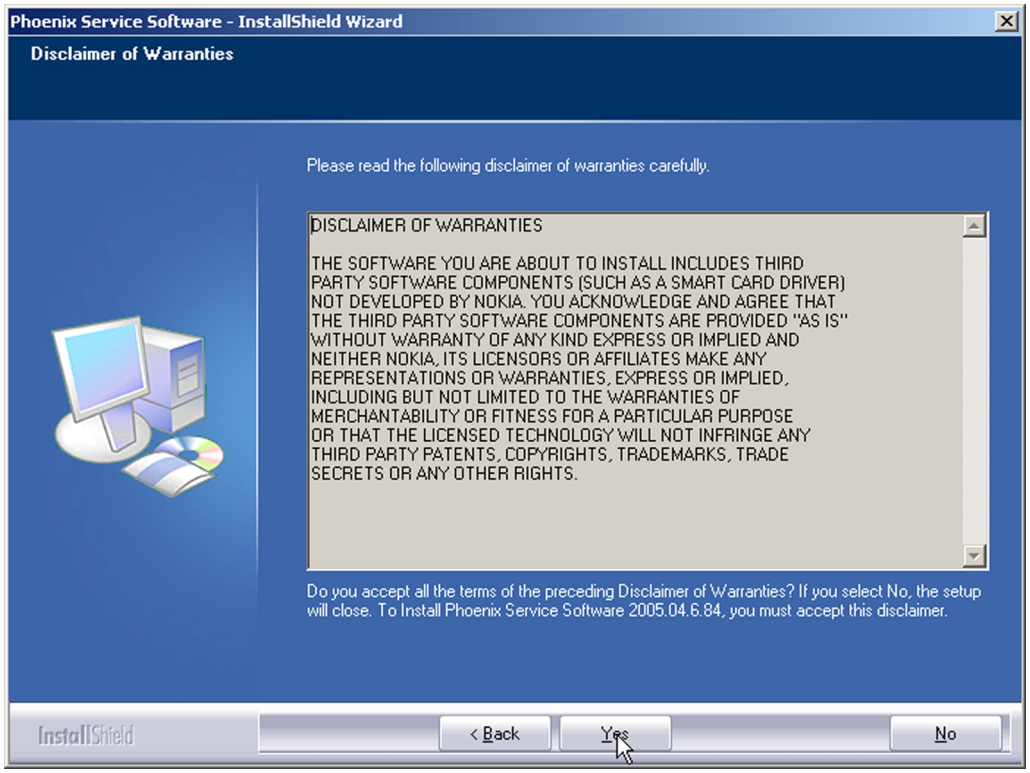

Figure 3 Disclaimer text

4. Choose the destination folder.
   The default folder *C:|ProgramFiles|Nokia|Phoenix* is recommended.
5. To continue, click **Next.**
   To choose another location, click **Browse** (not recommended).
6. Wait for the components to be copied.
   The progress of the installation is shown in the *Setup Status* window.
7. Wait for the drivers to be installed and updated.
   The process may take several minutes to complete.
   If the operating system does not require rebooting, the PC components are registered right away.
   If the operating system requires restarting your computer, the Install Shield Wizard will notifies about it.
   Select **Yes...** to reboot the PC immediately or **No...** to reboot the PC manually afterwards.
   After the reboot, all components are registered.

   Note: *Phoenix* does not work, if the components have not been registered.

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8. To end the installation, click **Finish**.

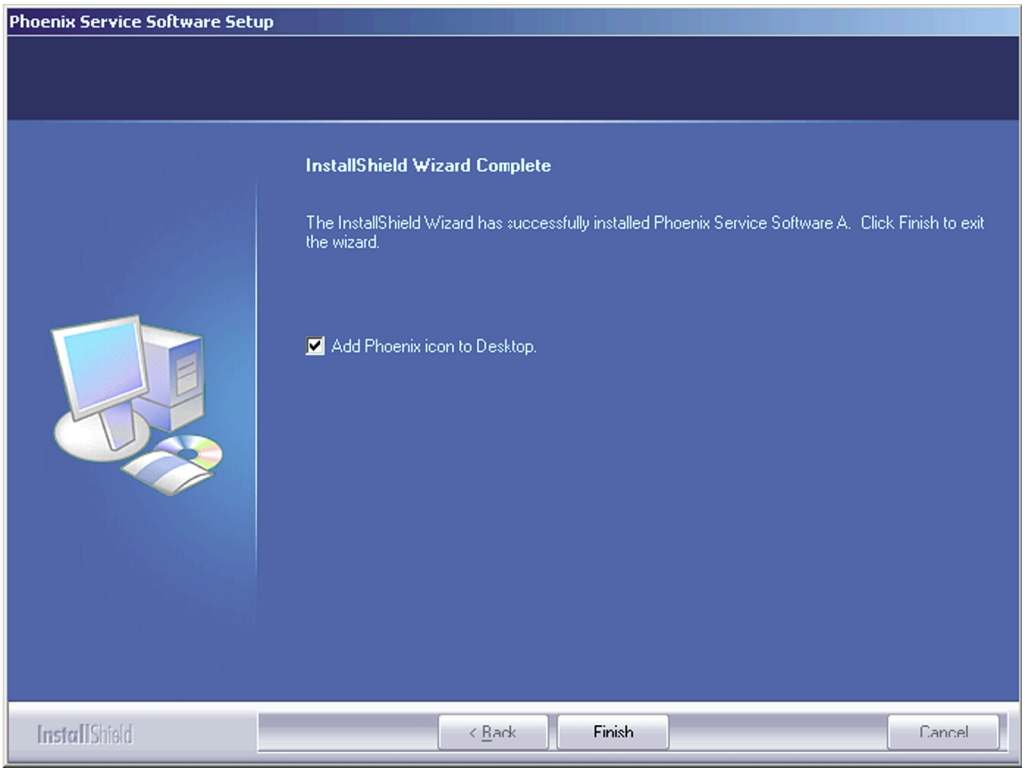

Figure 4 InstallShield Wizard Complete

Next actions

After the installation, *Phoenix* can be used after:

- installing phone model specific data package for *Phoenix*
- configuring users and connections

FPS-10 flash prommer can be used after updating their flash update package files.

Updating *Phoenix* installation

Context

- If you already have the *Phoenix* service software installed on your computer, you need to update the software when new versions are released.
- To update *Phoenix*, you need to follow the same steps as when installing it for the first time.
- When you are updating, for example, from version **a14_2004_16_4_47** to **a15_2004_24_7_55**, the update will take place automatically without uninstallation.
- Always use the latest available versions of both *Phoenix* and the phone-specific data package. Instructions can be found in the phone model specific Technical Bulletins and phone data package *readme.txt* files (shown during installation).
- If you try to update *Phoenix* with the same version you already have (for example, **a15_2004_24_7_55** to **a15_2004_24_7_55**), you are asked if you want to uninstall the existing version. In this case you can choose between a total uninstallation or a repair installation in a similar way when choosing to uninstall the application from the *Windows* Control Panel.
- If you try to install an older version (for example, downgrade from **a15_2004_24_7_55** to **a14_2004_16_4_47**), installation will be interrupted.

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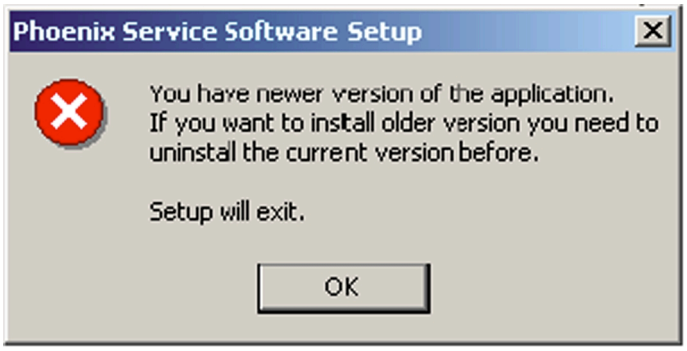

Figure 5 Installation interrupted

- Always follow the instructions on the screen.

Steps

1. Download the installation package to your computer hard disk.
2. Close all other programs.
3. Run the application file (for example, *phoenix_service_sw_2004_39_x_xx.exe*).

Results

A new *Phoenix* version is installed and driver versions are checked and updated.

Uninstalling *Phoenix*

Context

You can uninstall *Phoenix* service software manually from the *Windows* Control Panel.

Steps

1. Open the **Windows Control Panel**, and choose **Add/Remove Programs**.

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2. To uninstall *Phoenix*, choose **Phoenix Service Software→Change/Remove→Remove** .

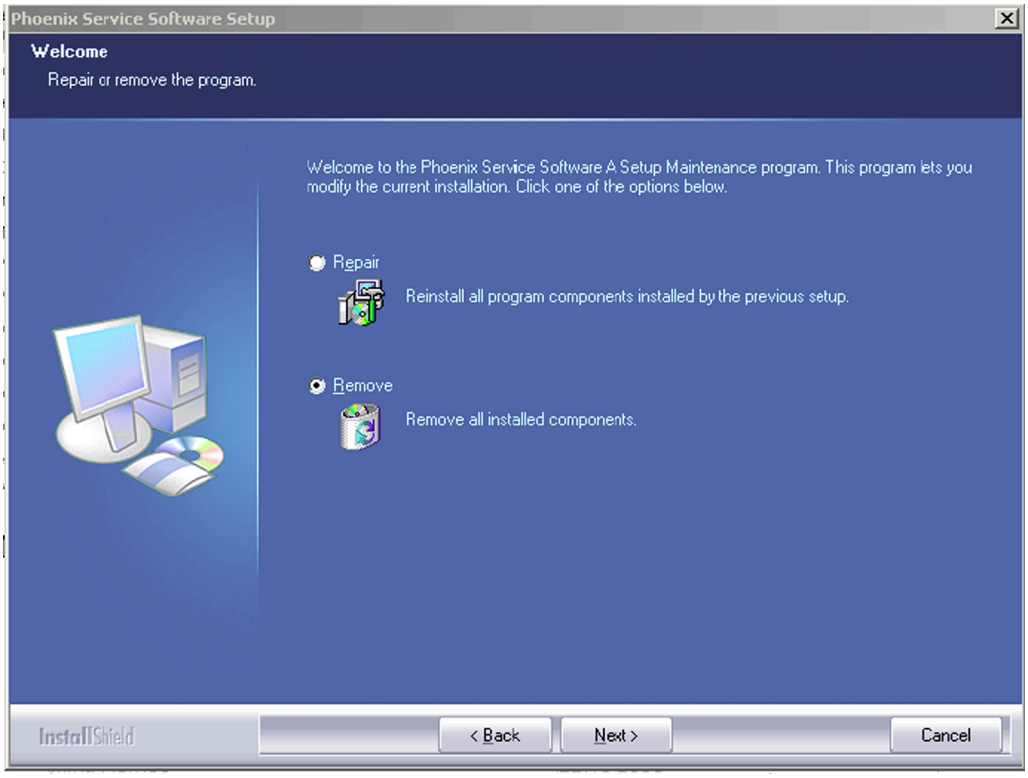

Figure 6 Remove program

The progress of the uninstallation is shown.

3. If the operating system does not require rebooting, click **Finish** to complete.

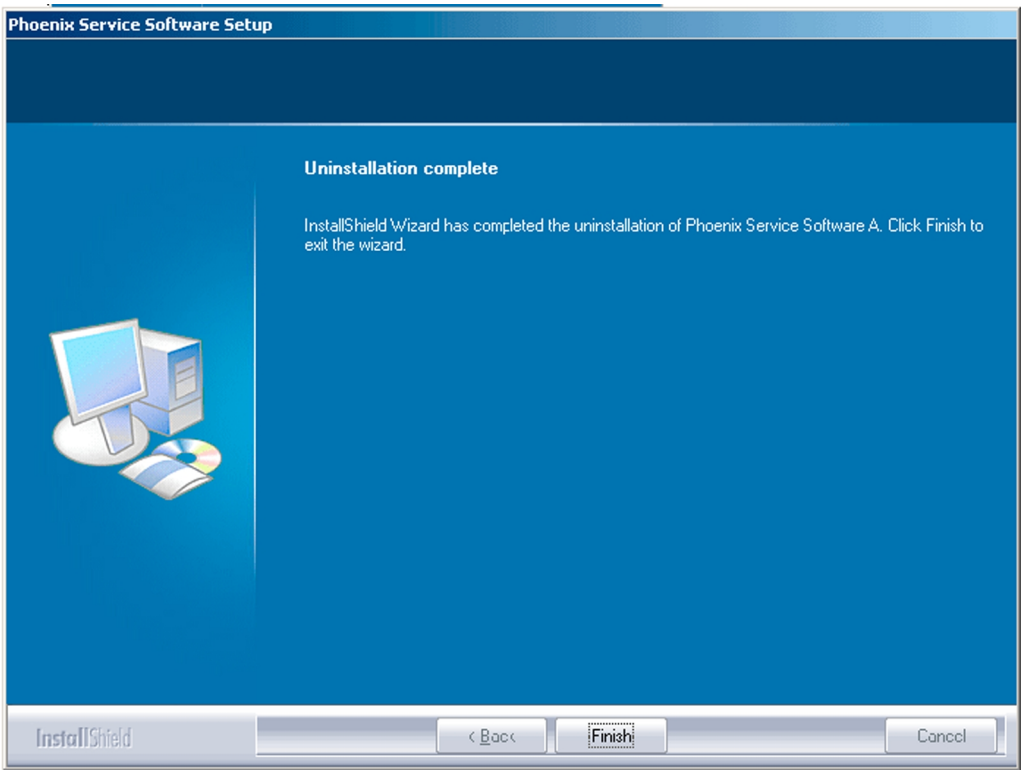

Figure 7 Finish uninstallation

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If the operating system requires rebooting, InstallShield Wizard will notify you. Select **Yes...** to reboot the PC immediately and **No...** to reboot the PC manually afterwards.

Repairing *Phoenix* installation

Context

If you experience any problems with the service software or suspect that files have been lost, use the repair function before completely reinstalling *Phoenix*.

Note: The original installation package (for example, *phoenix_service_sw_a15_2004_24_7_55.exe*) must be found on your PC when you run the repair setup.

Steps

1. Open **Windows Control Panel→Add/Remove Programs** .
2. Choose **Phoenix Service Software→Change/Remove** .
3. In the following view, select **Repair**.

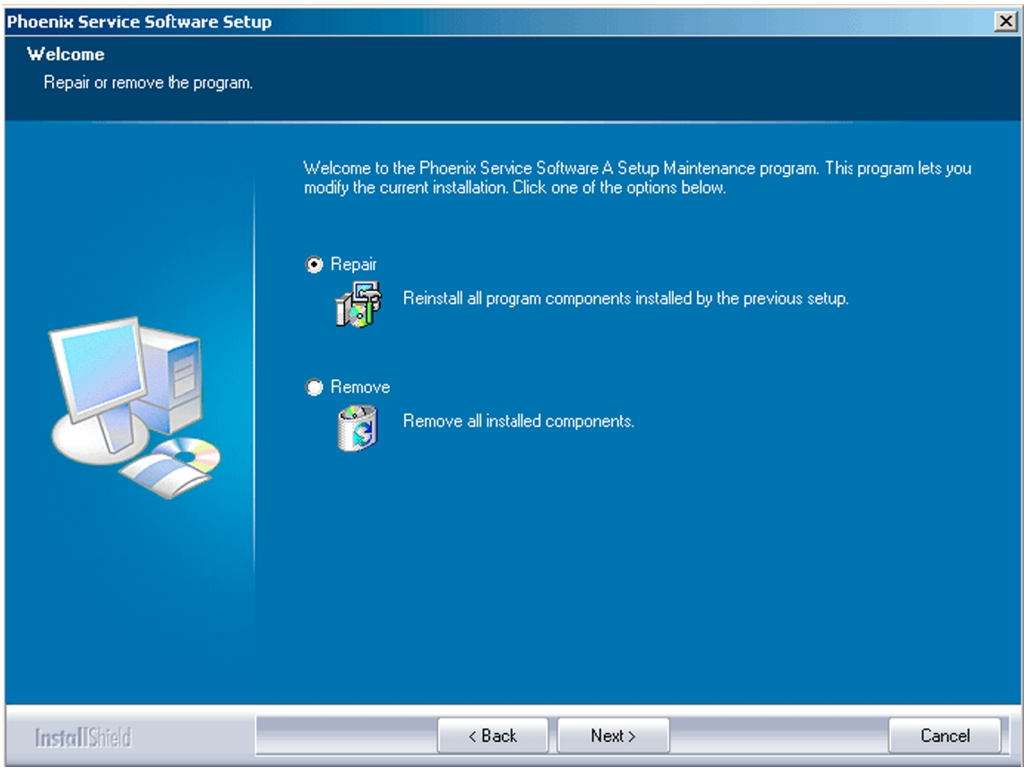

Figure 8 Repair program

Phoenix reinstalls components and registers them.

The procedure is the same as when updating *Phoenix*.

4. To complete the repair, click **Finish**.

Installing phone data package

Prerequisites

- A phone-specific data package contains all data required for the *Phoenix* service software and service tools to be used with a certain phone model.
- Check that a dongle is attached to the parallel port of your computer.

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- Install *Phoenix* service software.
- Download the installation package (for example, *XX-XX_dp_EA_v_1_0.exe*) to your computer (for example, in C:\TEMP).
- Close all other programs.

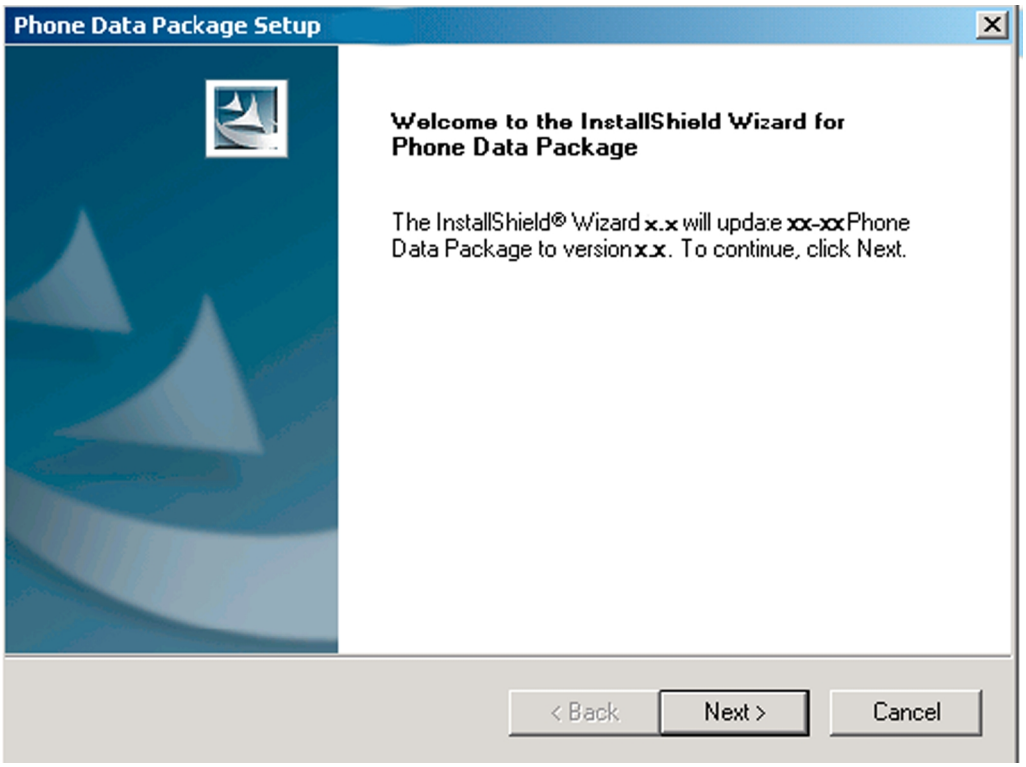
(XX-XX = type designator of the product)

If you already have *Phoenix* installed on your computer, you will need to update it when a new version is released.

> **Note:** Often *Phoenix* and the phone-specific data package come in pairs, meaning that a certain version of *Phoenix* can only be used with a certain version of a data package. Always use the latest available versions of both. Instructions can be found in phone-specific Technical Bulletins and *readme.txt* files of data packages.

Steps

1. To start the installation, run the application file (for example, *XX-XX_dp_EA_ v_1_0.exe*),
   Wait for the installation files to be extracted.
2. Click **Next**.



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3. In the following view you can see the contents of the data package. Read the text carefully. There is information about the *Phoenix* version required with this data package.

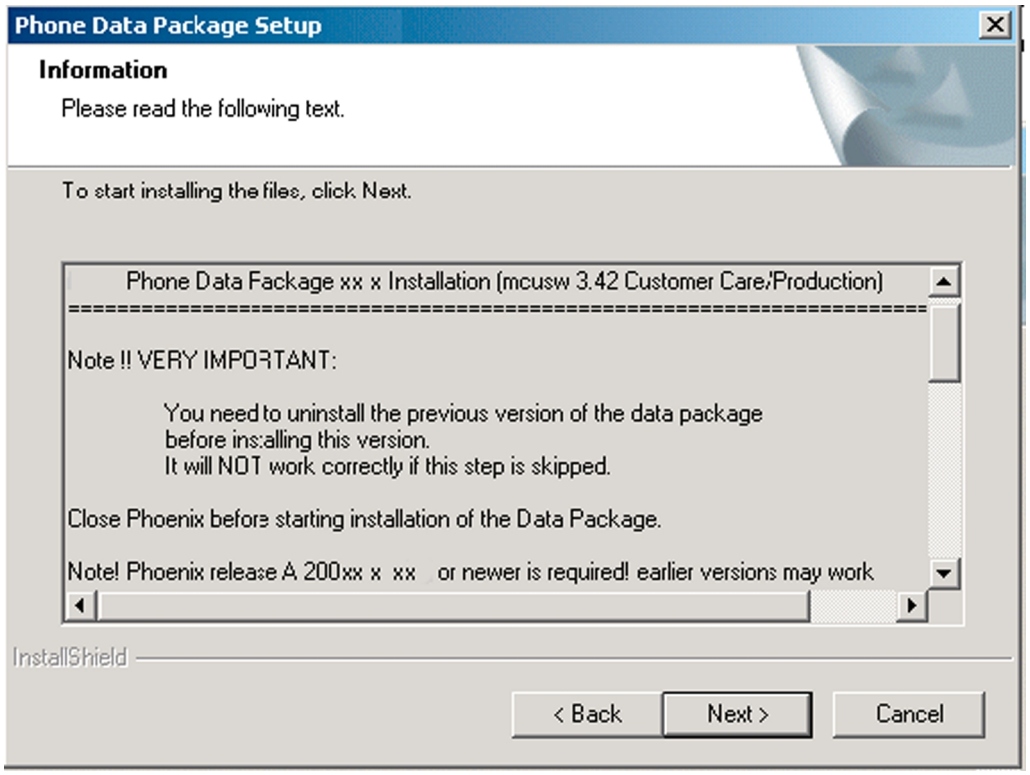

Figure 9 Data package setup information

4. To continue, click **Next**.
5. Choose the destination folder, and click **Next** to continue.

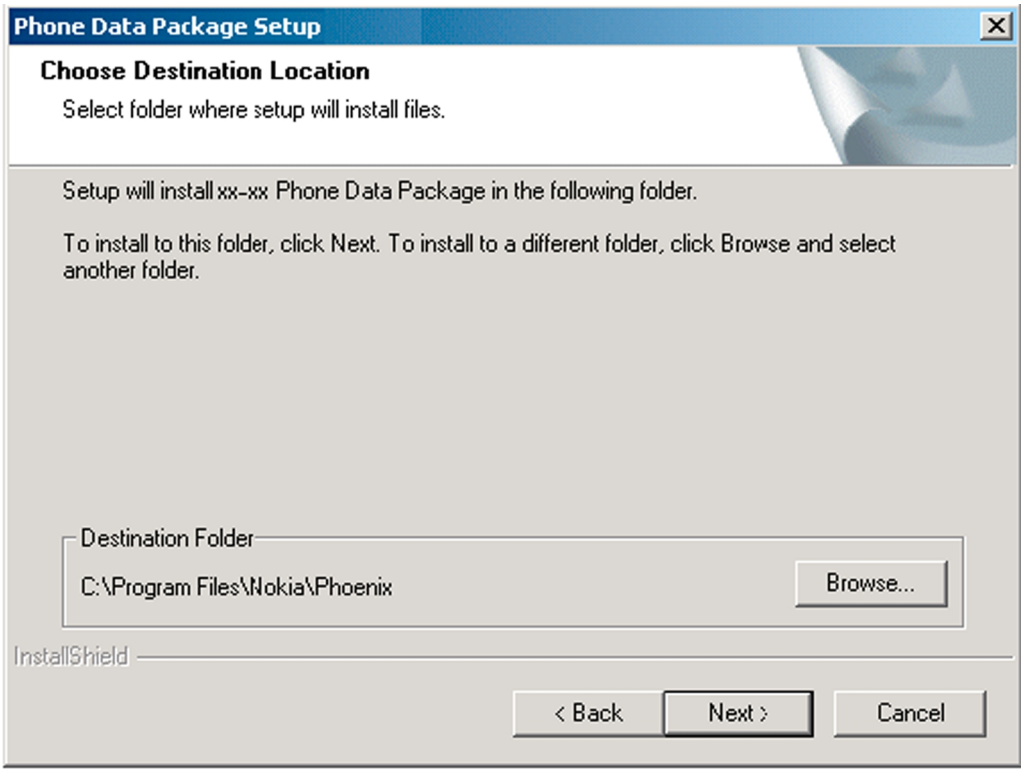

Figure 10 Data package destination folder

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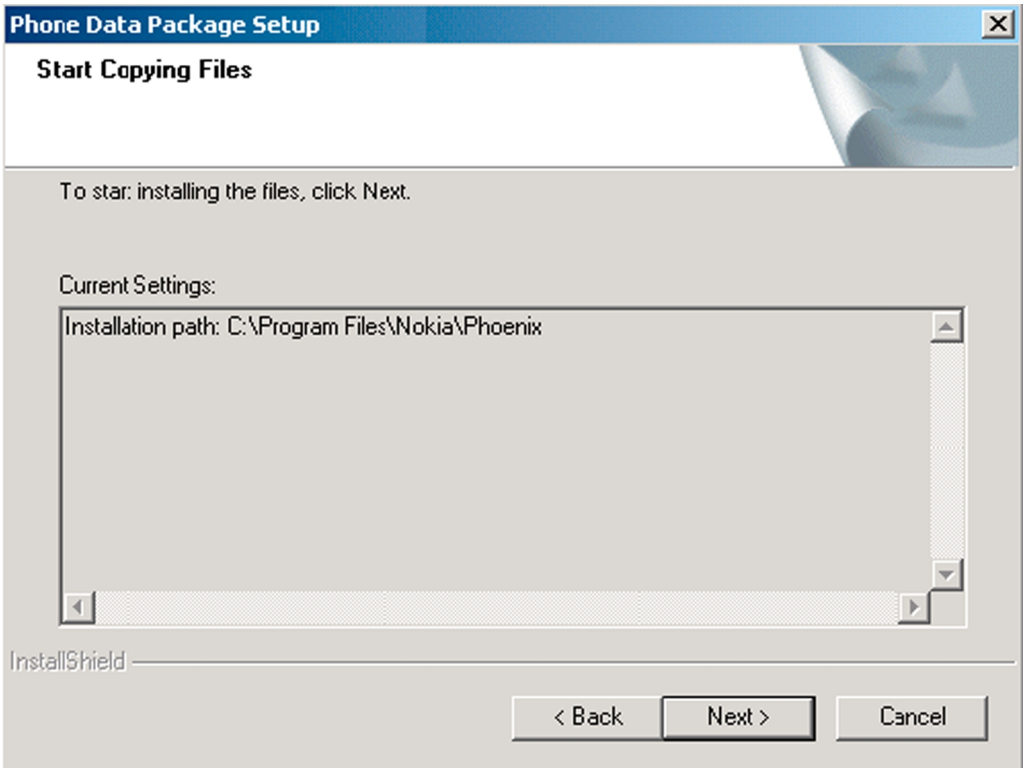
The InstallShield Wizard checks where *Phoenix* is installed, and the directory is shown.

6. To start copying the files, click **Next**.



Phone model specific files are installed. Please wait.

7. To complete the installation, click **Finish**.

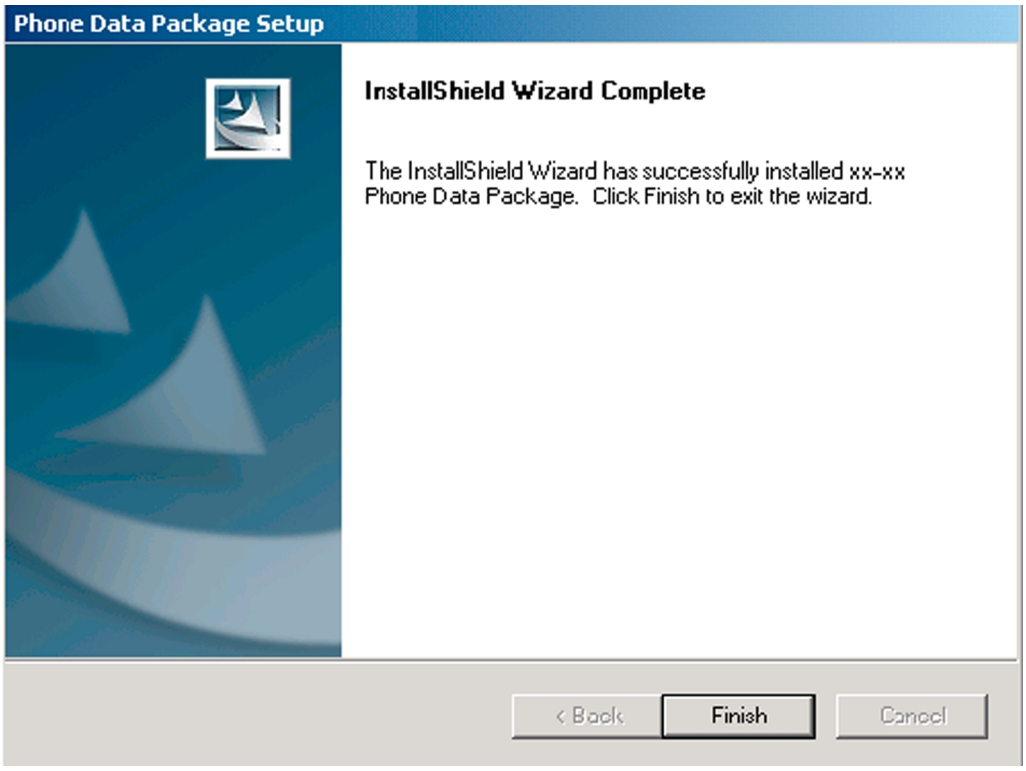


Figure 11 InstallShield Wizard Complete

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Next actions

Phoenix can be used for flashing phones and printing type labels after:

- Configuring users
- Managing connections

FPS-10 can be used after updating its flash update package files.

Uninstalling phone data package

Context

There is no need to uninstall an older version of a data package, unless instructions to do so are given in the *readme.txt* file of the data package and bulletins related to the release.

Please read all related documents carefully.

Steps

1. Locate the data package installation file (e.g. *XX-XX_dp_EA_v_1_0.exe*) from your computer.
2. To start the uninstallation procedure, double-click the data package installation file.
3. To uninstall the data package, click **OK** or to interrupt the uninstallation, click **Cancel**.

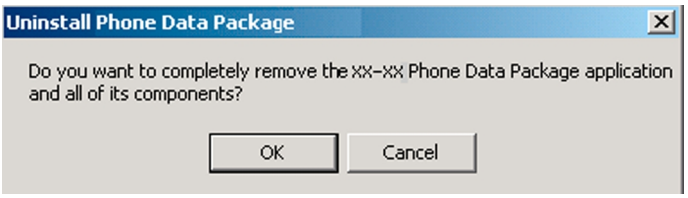

Figure 12 Uninstalling phone data package

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4. When the data package is uninstalled, click **Finish**.

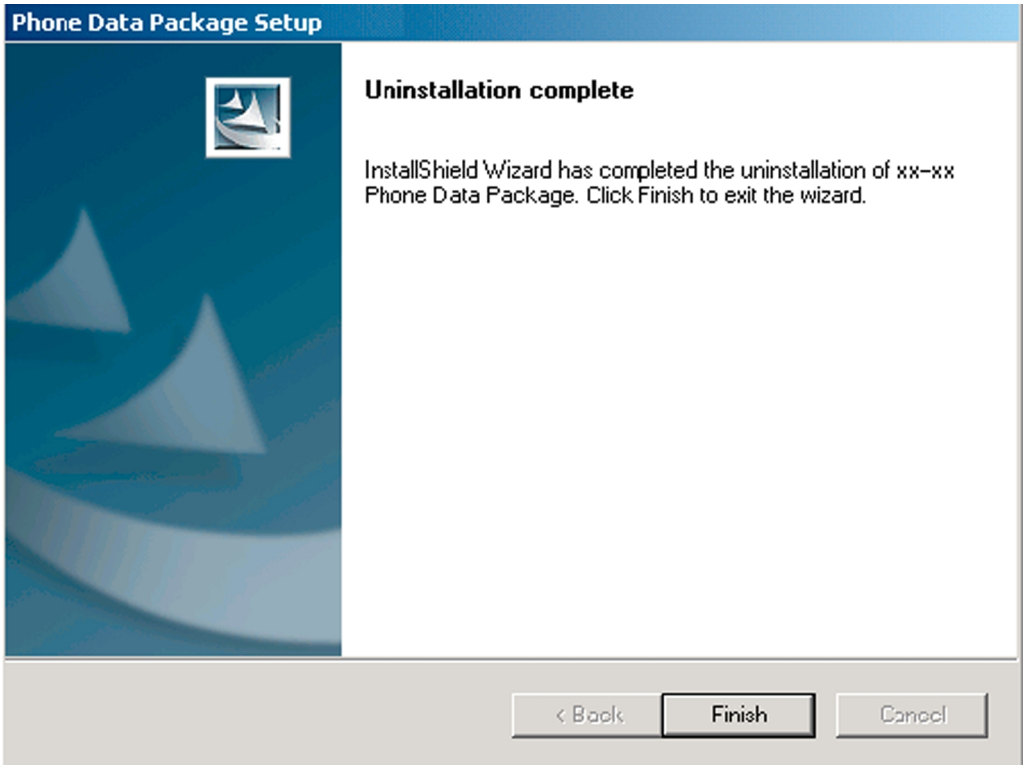

Figure 13 Finishing data package uninstallation

Alternative steps

- You can also uninstall the data package manually from **Control Panel→Add/Remove Programs→xx-xx* Phone Data Package** . (*= type designator of the phone).

Configuring users in *Phoenix*

Steps

1. Start *Phoenix* service software, and log in.

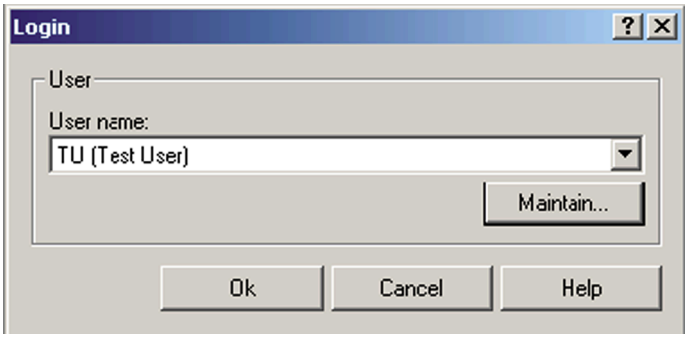

Figure 14 Phoenix login

If the user ID is already configured, select s/he from the *User name* drop-down list, and click **OK**.

2. To add a new user, or to edit existing ones, click **Maintain**.
3. To add a new user, click **New**.

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4. Type in the name and initials of the user, and click **OK**.

   The user is added to the user name list.

5. Select the desired user from the *User name* drop-down list, and click **OK**.

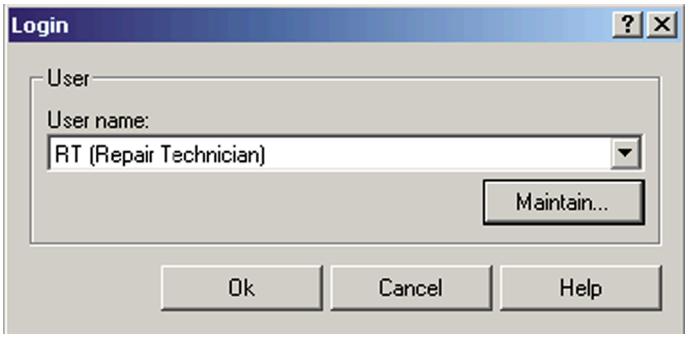


Figure 15 New user configured

Managing connections in *Phoenix*

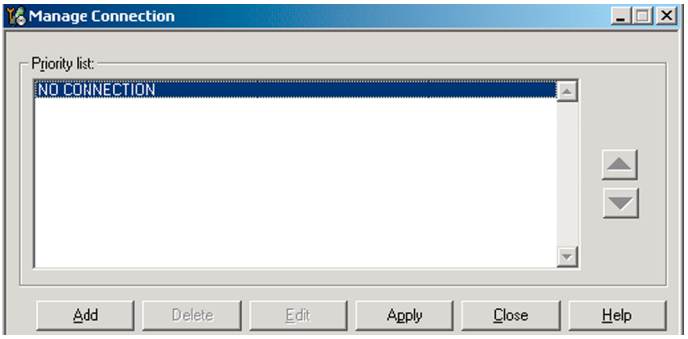
Context

With the **Manage Connections** feature you can edit and delete existing connections or create new ones.

> **Note:** After choosing the desired connection, and connecting the phone to a PC for the first time, allow the PC to install the USB device drivers first. Please note that this may take some time to complete.
>
> If there are problems after the driver installation, check that the USB connection is active from the **Windows Control Panel**. If the problem persists, contact the local PC support.

Steps

1. Start *Phoenix*, and log in.
2. Choose **File→Manage Connections...** .
3. To add a new connection, click **Add**.



4. Select **Manual** mode, and click **Next** to continue.

   If you want to create the connection using the Connection Wizard, connect the tools and a phone to your PC. The wizard will automatically try to configure the correct connection.

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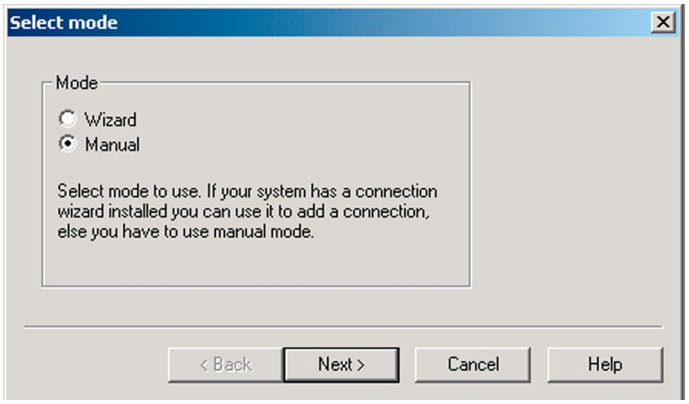

Figure 16 Select mode: Manual

i For an FPS-10 flash prommer with a **USB Connection**, choose the following connection settings:
- Media: **FPS-10 USB**
- DEVICE_INDEX: **0**
- SERIAL_NUM: See Serial No from the label attached to the bottom of FPS-10
- ACTIVE_MEDIA: **USB**

ii For an FPS-10 flash prommer with a **LAN connection**, choose the following connection settings:
- Media: **FPS-10 TCP/IP**
- NET_SERV_NAME: Click **Scan...**. Choose your own FPS-10 device based on the correct MAC address. See Serial No from the label attached to the bottom of your FPS-10.
- PORT_NUM: Use the default value, and click **Next**.
- PROTOCOL_FAMILY: Use the default value, and click **Next**.
- SOCKET TYPE: Use the default value, and click **Next**.
- TX_BUFFER_SIZE: Use the default value, and click **Next**.
- RX_BUFFER_SIZE: Use the default value, and click **Next**.

iii For a plain **USB connection**, choose the following connection settings:

Note: First connect the DKU-2 or CA-53 USB cable between the PC USB port and phone.
- Media: USB

5. To complete the configuration, click **Finish**.
6. Click the connection you want to activate. Use the up/down arrows located on the right hand side to move it on top of the list, then click **Apply**.

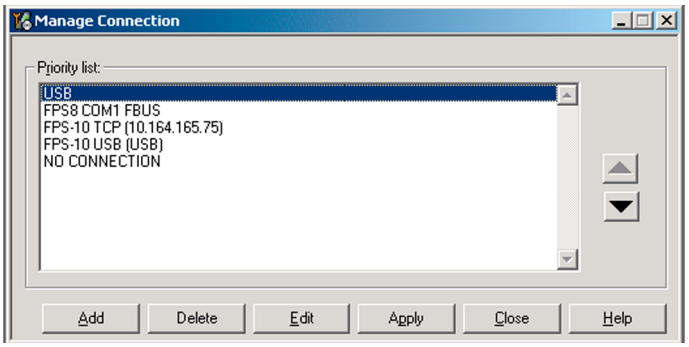

Figure 17 Connections list

The connection is activated, and it can be used after closing the *Manage Connection* window.

The connection information is shown at the right hand bottom corner of the screen.

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Figure 18 Connection information

7. To use the connection, connect the phone to your PC with correct service tools. Make sure the phone is switched on, and then choose **File→Scan Product** .

Results

The product support module information appears in the status bar:

Figure 19 Product support module information (example from RM-1)

Installing flash support files for FPS-10

Prerequisites

- Install *Phoenix* service software.
- Install phone model specific data package for *Phoenix*.
- If you want to update the flash support files, they are delivered in the same installation package with *Phoenix* or newer *Phoenix* packages beginning from December 2004.

  In case you want to update the MCU files, install the latest data package (see Technical Bulletins for information on the latest one).

  Normally, it is enough to install *Phoenix* and the phone-specific data package because the installation always includes the latest flash update package files for FPS-10.
- A separate installation package for flash support files is available. The files can be updated according to these instructions, if updates appear between *Phoenix* data package releases.

Context

If you are not using a separate installation package, you can skip this section and continue with "Updating FPS-10 flash prommer software" (page 3–22) after installing a new phone data package.

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Steps

1. To begin the installation, double-click the flash update file (for example, *flash_update_03_183_0014.exe*).

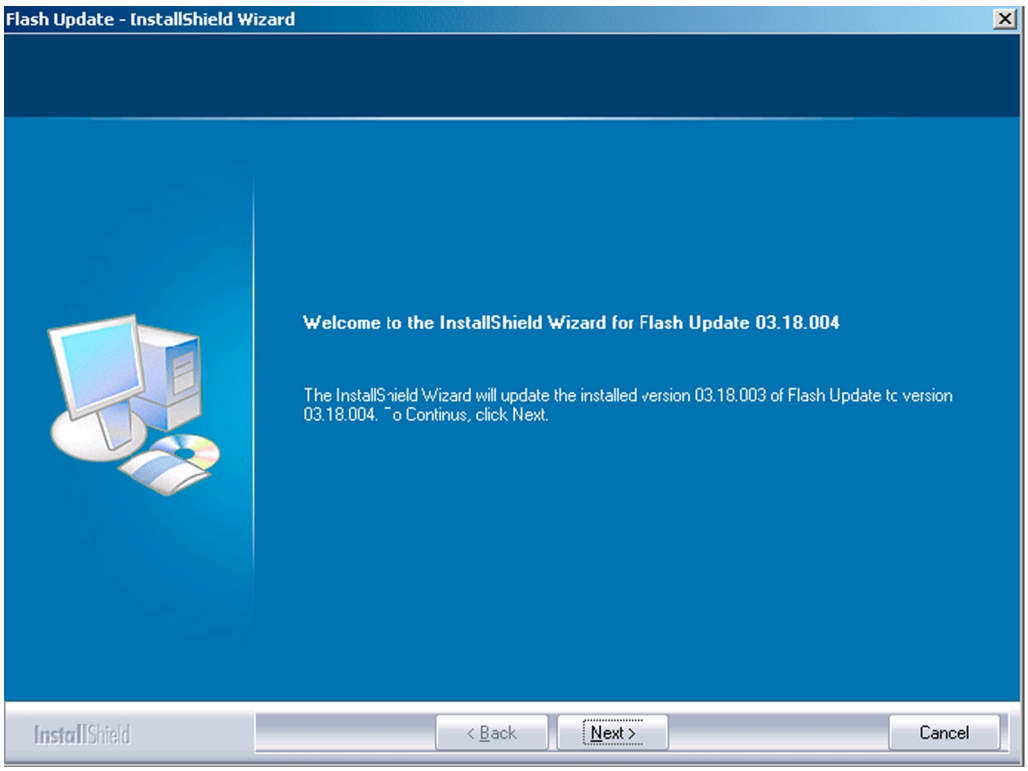

Figure 20 Flash update welcome dialog

If the same version of the flash update package already exists, and you want to reinstall it, the previous package is first uninstalled.

Restart installation again after the uninstallation.

2. If you try to downgrade the existing version to older ones, the setup will be aborted. If there is a need to downgrade the version, uninstall newer files manually from the **Windows Control Panel**, and then rerun the installation.

Figure 21 Flash installation interrupted

If an older version exists on your PC and it needs to be updated, click **Next** to continue installation.

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3. It is recommended to install the files to the default destination folder *C:|Program Files|Nokia|Phoenix*. To continue, click **Next**.

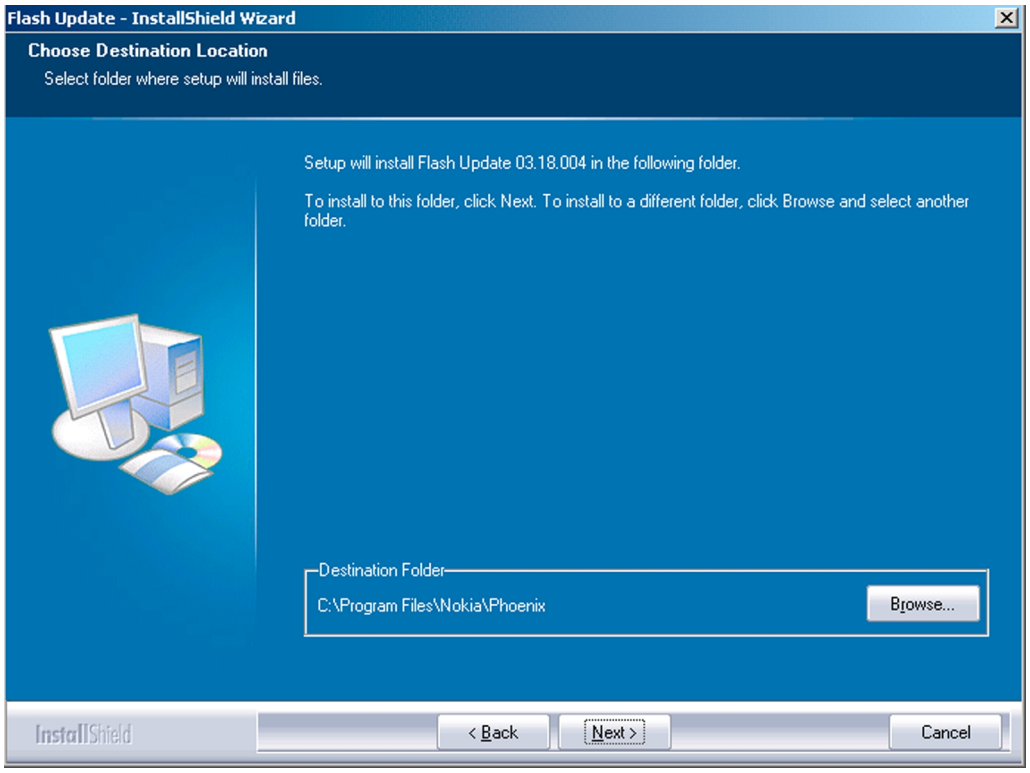

Figure 22 Flash destination folder

When installing the flash update files for the first time, you may choose another location by selecting **Browse** (not recommended).

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4. To complete the installation procedure, click **Finish** .

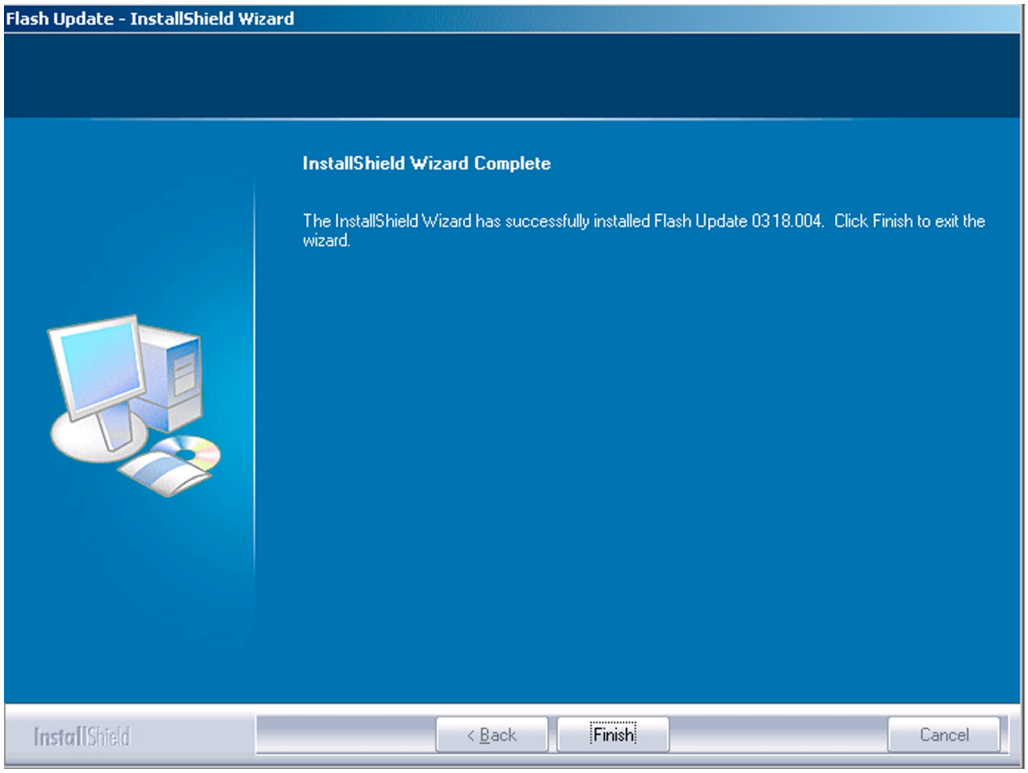

Figure 23 Finish flash update

Next actions

FPS-10 flash prommer must be updated using *Phoenix*.

Updating FPS-10 flash prommer software

Steps

1. Start *Phoenix* service software, and log in.
2. Choose the correct connection for your flash prommer: **File→Manage Connections...**
3. Choose **Flashing→Prommer maintenance** .
4. To update the **FPS-10** software, click **Update**, and select the appropriate file or *fpsxupd.ini* (for FPS-10) from *C:|Program Files|Nokia|Phoenix|Flash*.

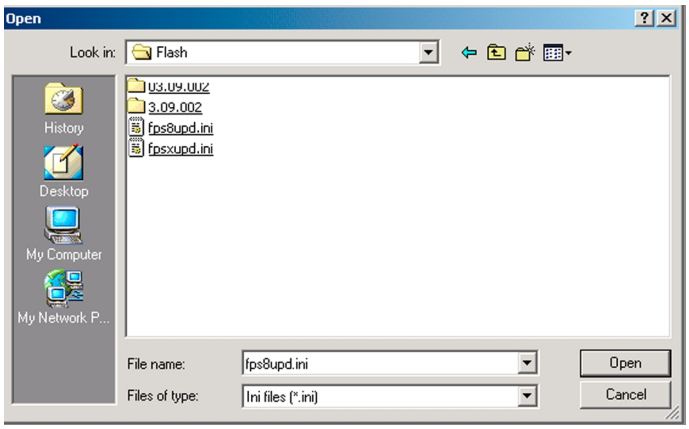

Figure 24 Flash directory window

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Tip: All files can be loaded separately to the prommer used. To do this, click the right mouse button in the *Flash Box Files* pane and select the file type(s) to be loaded.

5. Click **OK**.

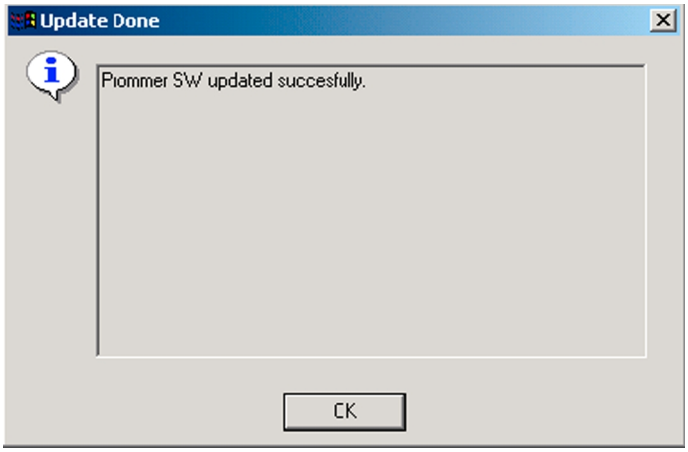

Figure 25 Prommer software update finished

6. To close the *Prommer Maintenance* window, click **Close**.

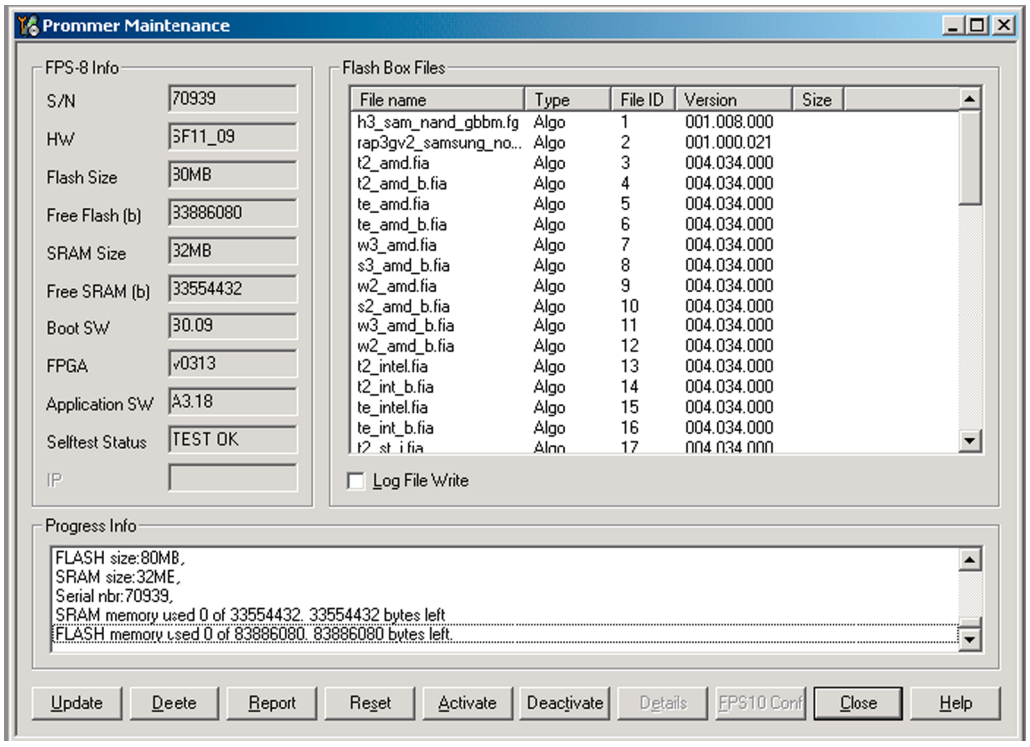

Figure 26 *Prommer Maintenance* window

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4 — Service Tools and Service Concepts

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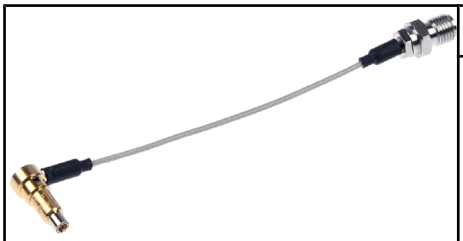
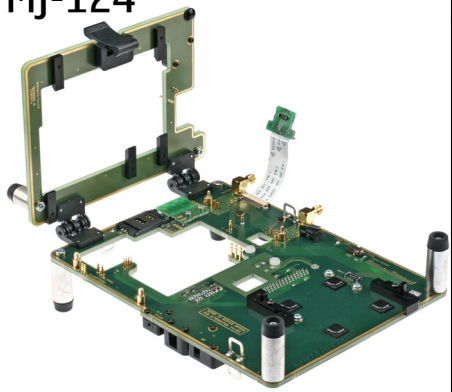
New service devices

The table below gives a short overview of service tools that can be used for testing, error analysis and repair of product RM-227, refer to various concepts.

	CA-56RS	RF cable	
	Small RF cable that is used for RF tuning with product specific module jig.		
FS-48	FS-48	Product specific adapter	
	RM-227 specific adapter.		
MJ-124 	MJ-124	Module jig	
	RM-227 specific module jig.		
RJ-149	RJ-149	Soldering jig	
	RM-227 specific soldering jig.		
SS-109	SS-109	Domesheet assembly jig	

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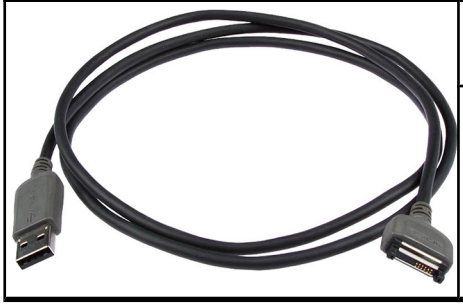
Generic and reused service devices

The table below gives a short overview of service tools that can be used for testing, error analysis and repair of product RM-227, refer to various concepts.

	AC-33	Power supply	
	Universal power supply for FPS-10; included in the FPS-10 sales package.		
	CA-31D	USB cable	
	The CA-31D USB cable is used to connect FPS-10 or FPS-11 to a PC. It is included in the FPS-10 and FPS-11 sales packages.		
	CA-35S	Power cable	
	CA-35S is a power cable for connecting, for example, the FPS-10 flash prommer to the Point-Of-Sales (POS) flash adapter.		
	CA-53	USB connectivity cable	
	USB to system connector cable.		

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CU-4	Control unit	

CU-4 is a general service tool used with a module jig and/or a flash adapter. It requires an external 12 V power supply.

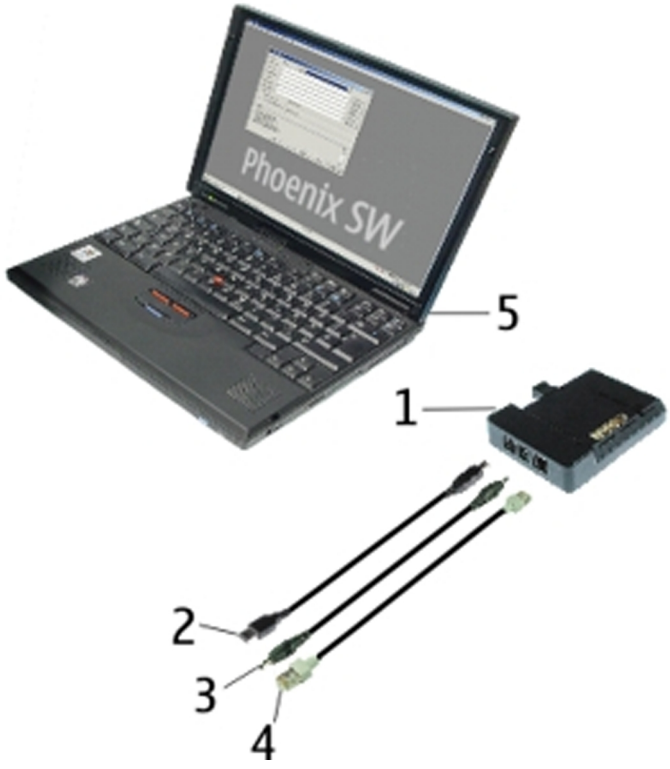
The unit has the following features:

- software controlled via USB
- EM calibration function
- Forwards FBUS/Flashbus traffic to/from terminal
- Forwards USB traffic to/from terminal
- software controlled BSI values
- regulated VBATT voltage
- 2 x USB2.0 connector (Hub)
- FBUS and USB connections supported

When using CU-4, note the special order of connecting cables and other service equipment:

Instructions

1 Connect a service tool (jig, flash adapter) to CU-4.
2 Connect CU-4 to your PC with a USB cable.
3 Connect supply voltage (12 V)
4 Connect an FBUS cable (if necessary).
5 Start Phoenix service software.



Note: Phoenix enables CU-4 regulators via USB when it is started.

Reconnecting the power supply requires a Phoenix restart.

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FLS-4S	Flash device	
FLS-4S is a dongle and flash device incorporated into one package, developed specifically for POS use.		

FPS-10	Flash prommer	

FPS-10 interfaces with:

- PC
- Control unit
- Flash adapter
- Smart card

FPS-10 flash prommer features:

- Flash functionality for BB5 and DCT-4 terminals
- Smart Card reader for SX-2 or SX-4
- USB traffic forwarding
- USB to FBUS/Flashbus conversion
- LAN to FBUS/Flashbus and USB conversion
- Vusb output switchable by PC command

FPS-10 sales package includes:

- FPS-10 prommer
- Power Supply with 5 country specific cords
- USB cable

PCS-1	Power cable	
The PCS-1 power cable (DC) is used with a docking station, a module jig or a control unit to supply a controlled operating voltage.		

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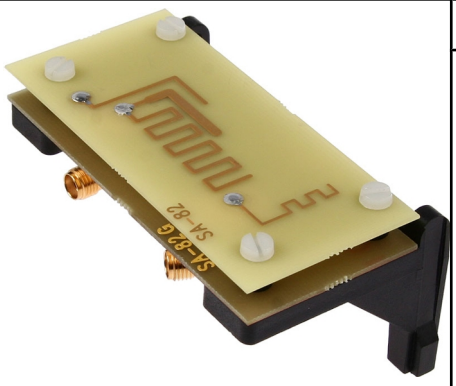
PKD-1	SW security device	

SW security device is a piece of hardware enabling the use of the service software when connected to the parallel (LPT) port of the PC.

Without the device, it is not possible to use the service software.

Printer or any such device can be connected to the PC through the device if needed.



SA-82	GSM&WCDMA coupler	

RM-89 specific GSM&WCDMA coupler.

- Flash adapter antenna coupler SA-82 attenuation table for NOKIA E61, measured with Universal Radio Communication Tester CMU-200.

Table 8 Attenuation table for antenna coupler SA-82

System	Channel	Tx-att. (dB)	Rx-att. (dB)
GSM 850	128	3.5	4
	190	4	4
	251	4.3	4
GSM 900	975	3.7	3
	38	3.5	3
	124	4	3
GSM 1800	512	7	5
	698	5.8	5
	885	5.4	6
GSM 1900	512	5.7	5
	700	5.3	5
	810	5.5	7
	TX / RX		
WCDMA	9612 / 10562	10.6	10
	9750 / 10700	10.5	11
	9888 / 10838	8.6	11

Note: Tx-attenuation tolerance is +/-0.5 dB.

Rx-attenuation tolerance is +/-1.0dB.

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	SB-6	Bluetooth tester	
	The SB-6 test box is a generic device to perform Bluetooth bit error rate testing and doing cordless FBUS connection via Bluetooth.		
	SB-7	WLAN test box	
	WLAN test requires defined position for the device.		
	SRT-6	Opening tool	
	SRT-6 is used to open phone covers and B-to-B connectors.		
	SS-46	Interface adapter	
	SS-46 acts as an interface adapter between the flash adapter and FPS-10.		

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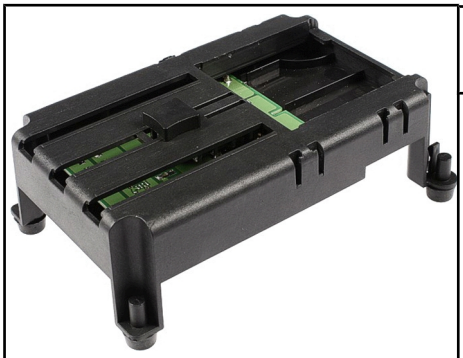


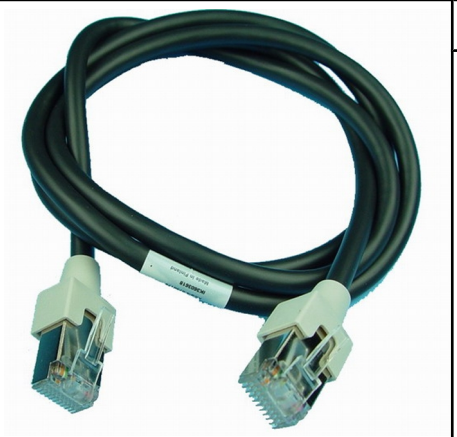
SS-62	Generic flash adapter base for BB5	

- generic base for flash adapters and couplers
- SS-62 equipped with a clip interlock system
- provides standardised interface towards Control Unit
- provides RF connection using galvanic connector or coupler
- multiplexing between USB and FBUS media, controlled by VUSB

SX-4	Smart card	

SX-4 is a BB5 security device used to protect critical features in tuning and testing.

SX-4 is also needed together with FPS-10 when DCT-4 phones are flashed.



XCS-4	Modular cable	

XCS-4 is a shielded (one specially shielded conductor) modular cable for flashing and service purposes.

XRS-6	RF cable	

The RF cable is used to connect, for example, a module repair jig to the RF measurement equipment.

SMA to N-Connector approximately 610 mm.

Attenuation for:

- GSM850/900: 0.3+-0.1 dB
- GSM1800/1900: 0.5+-0.1 dB
- WLAN: 0.6+-0.1dB

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Service concepts

Flash concept with FPS-10

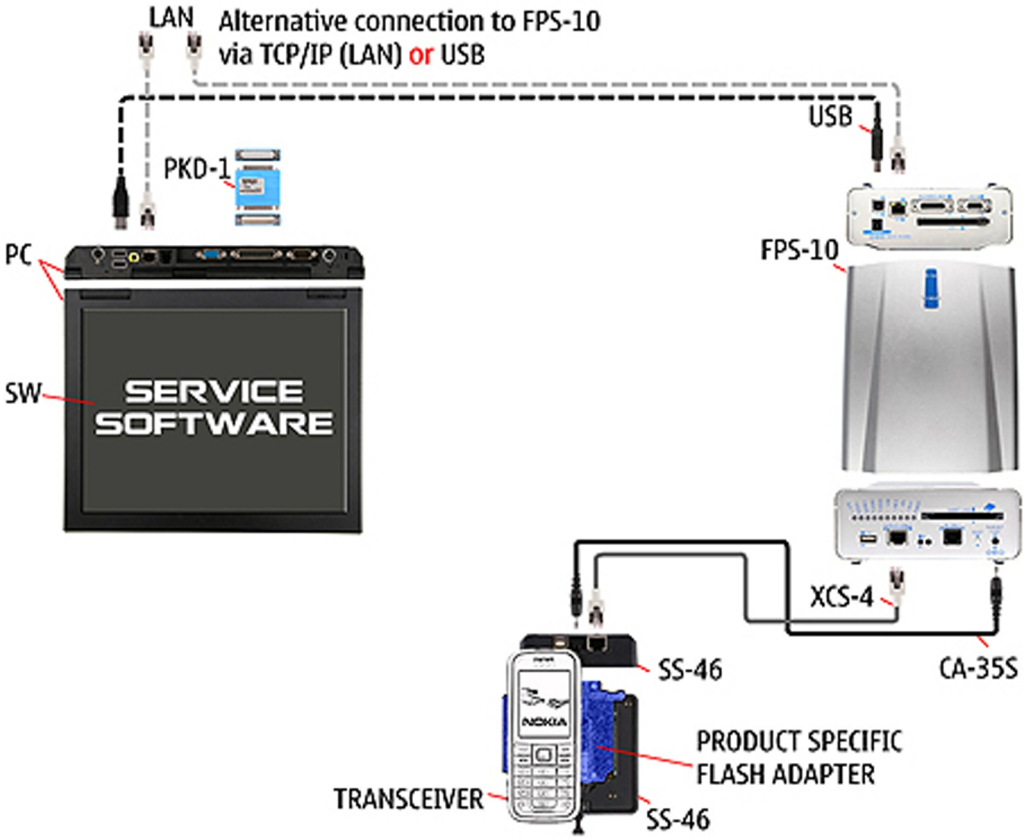

Figure 27 Basic flash concept with FPS-10

Type	Description
Product specific tools	
FS-48	Flash adapter
Other tools	
FPS-10	Flash prommer box
PKD-1/PK-1	SW security device
SS-46	Interface adapter
	PC with Phoenix service software
Cables	
XCS-4	Modular cable
CA-35S	Power cable
	USB cable

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Module jig service concept

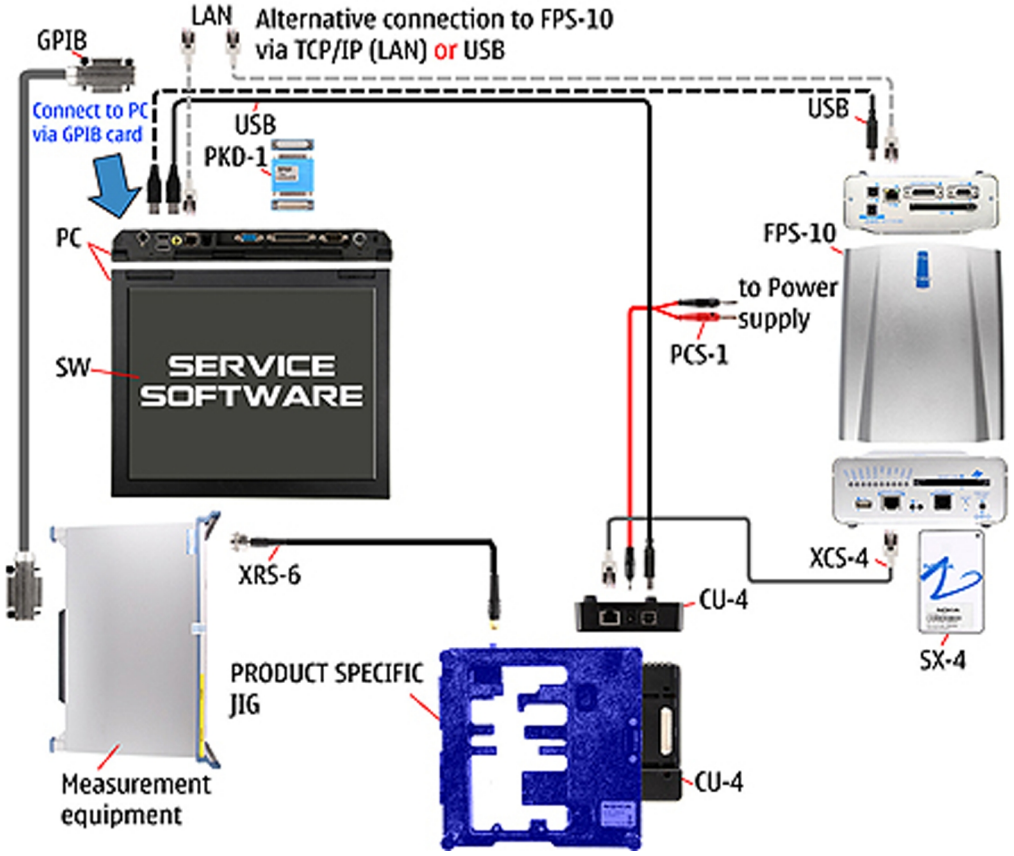

Figure 28 Module jig service concept

Type	Description
Phone specific tools	
MJ-124	Module jig
Other tools	
CU-4	Control unit
FPS-10	Flash prommer box
PKD-1/PK-1	SW security device
SX-4	Smart card
	PC with Phoenix service software
	Measurement equipment
Cables	
PCS-1	DC power cable
XCS-4	Modular cable
XRS-6	RF cable
	USB cable

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Type	Description
	GPIB control cable

POS (Point of Sale) flash concept

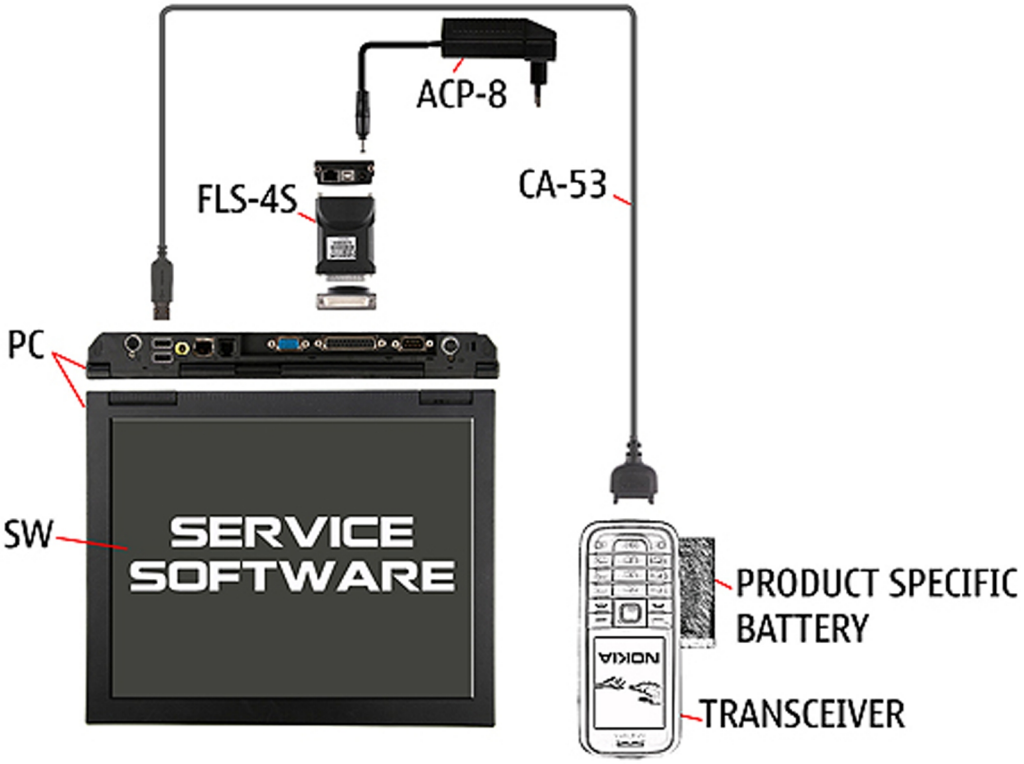

Figure 29 POS flash concept

Type	Description
Product specific tools	
BP-4L	Battery
Other tools	
ACP-8	Power adapter
FLS-4S	POS flash dongle
	PC with Phoenix service software
Cables	
CA-53	USB connectivity cable

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Service concept for RF testing and RF/BB tuning

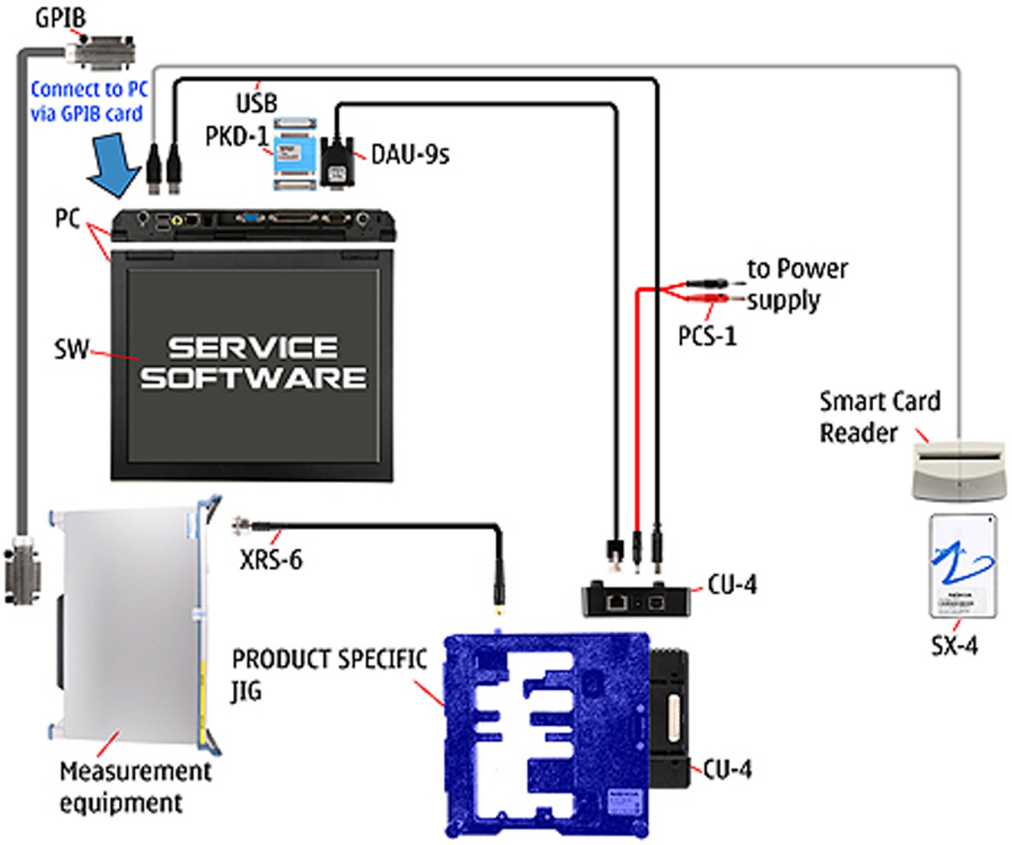

Figure 30 Service concept for RF testing and RF/BB tuning

Type	Description
Product specific tools	
MJ-124	Module jig
Other tools	
CU-4	Control unit
PKD-1/PK-1	SW security device
SX-4	Smart card
	Measurement equipment
	Smart card reader
	PC with Phoenix service software
Cables	
DAU-9s	MBUS cable
PCS-1	DC power cable
XRS-6	RF cable
	GPIB control cable

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Type	Description
	USB cable

CU-4 flash concept with FPS-10

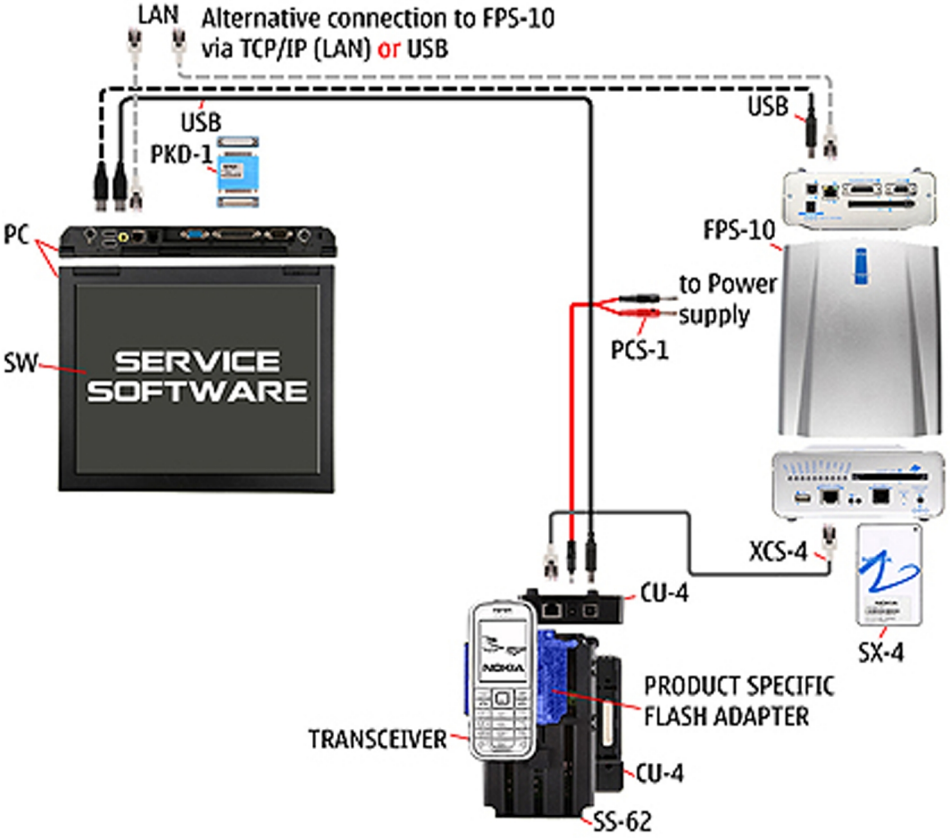

Figure 31 CU-4 flash concept with FPS-10

Type	Description
Product specific tools	
FS-48	Flash adapter
Other tools	
CU-4	Control unit
FPS-10	Flash prommer box
PKD-1/PK-1	SW security device
SS-62	Flash adapter base
SX-4	Smart card
	PC with Phoenix service software
Cables	
PCS-1	Power cable
XCS-4	Modular cable
	Standard USB cable

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Type	Description
	USB cable

RF testing concept with RF coupler

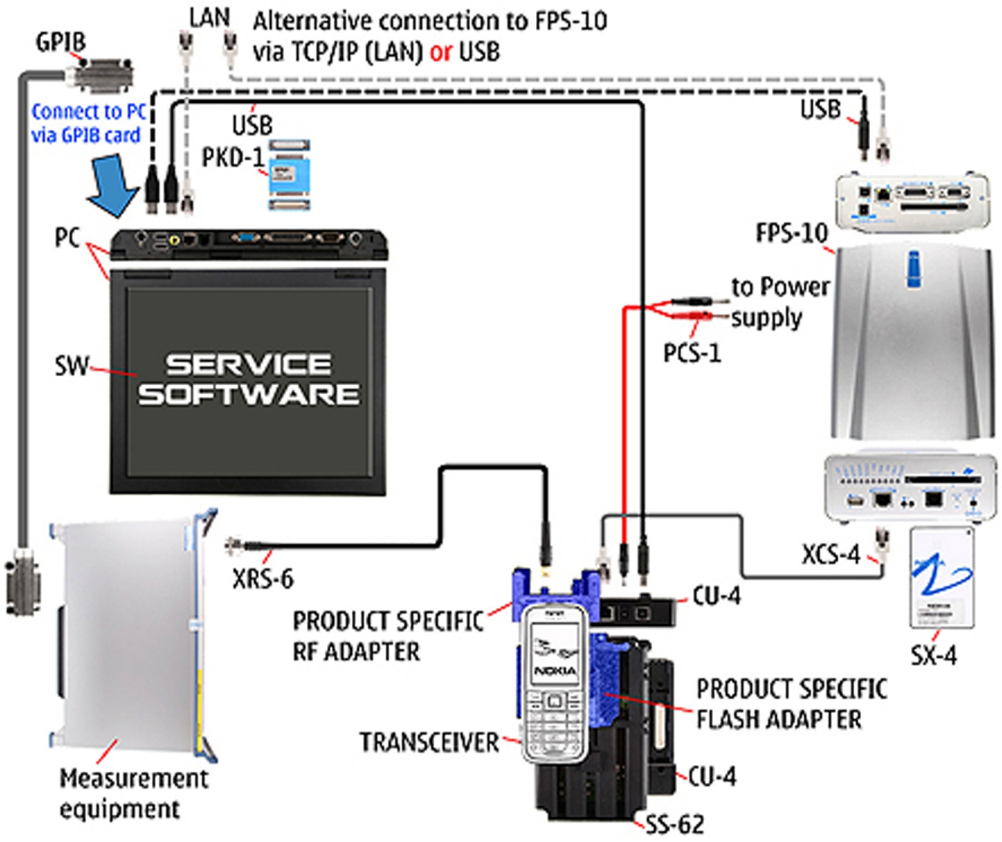

Figure 32 RF testing concept with RF coupler

Type	Description
Product specific tools	
FS-48	Flash adapter
SA-82	RF coupler
Other tools	
CU-4	Control unit
SX-4	Smart card
FPS-10	Flash prommer box
PKD-1/PK-1	SW security device
SS-62	Flash adapter base
	Measurement equipment
	PC with Phoenix service software
Cables	
PCS-1	Power cable

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Type	Description
XCS-4	Modular cable
XRS-6	RF cable
	GPIB control cable
	USB cable

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5 — Disassembly / Reassembly Instructions

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Disassembly instructions

Prerequisites

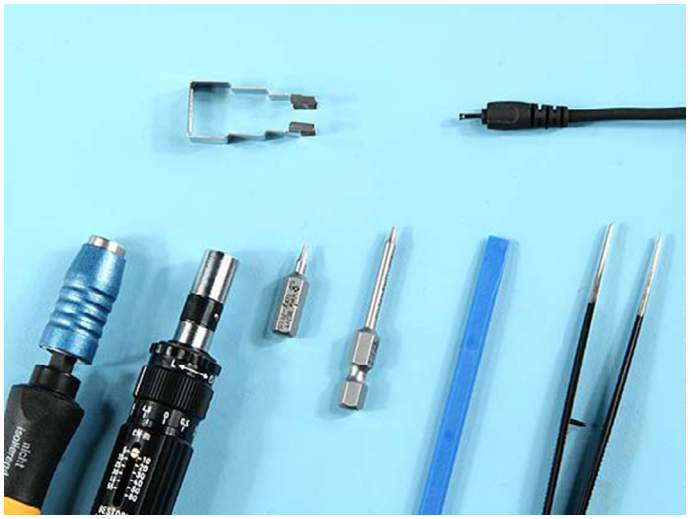

Figure 33 Needed tools: a Torx driver, a torque driver, a Torx plus size 4 bit, a Torx plus size 6 bit, the SS-93 opening tool, metal tweezers, the SS-102 camera removal tool and a DC-plug.

Steps

1. Push the BATTERY RELEASE BUTTON and remove the BATTERY COVER.

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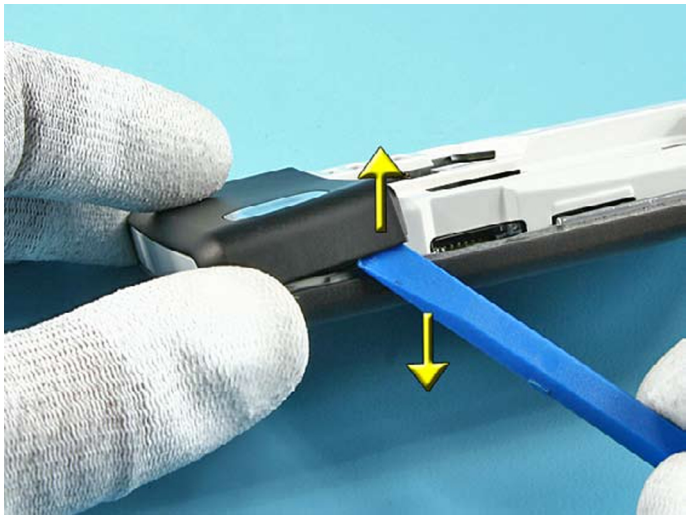
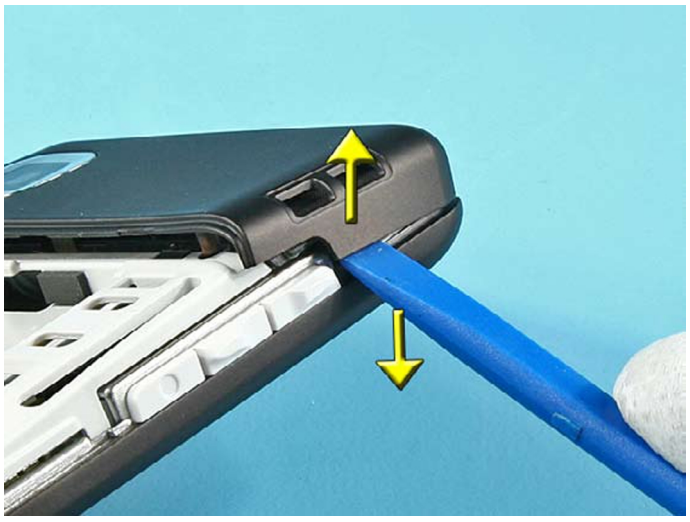
2. First unlock the snap of the CAMERA LID on the shown side.



3. Do the same on the other side.



4. Then gently lift the CAMERA LID with the SS-93 and remove it.

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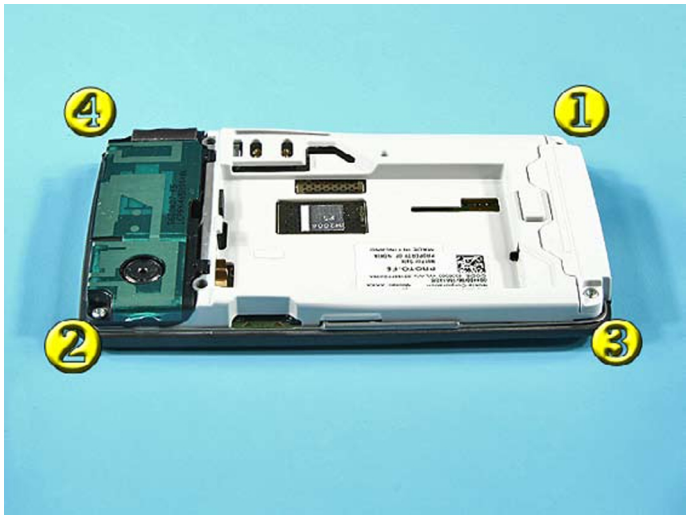
5. Unscrew the four Torx Plus® size 6 screws in the order shown and discard them.



6. Remove the assemblies from the A-COVER.

7. Separate the KEYMAT from the A-COVER.

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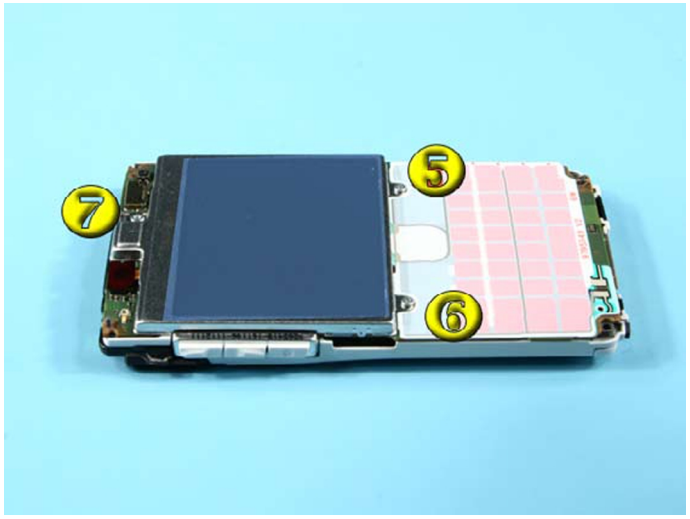
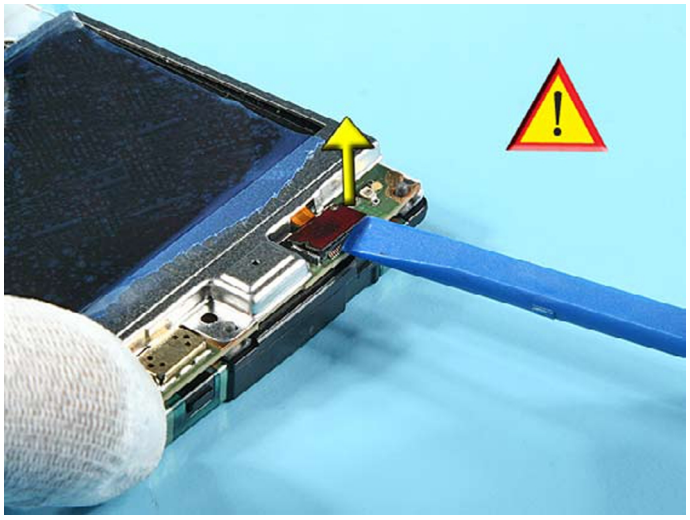
8. If needed, carefully unlock and remove the OPERATOR LOGO.

9. Unscrew the two Torx Plus ® size 4 screws (5 and 6) and discard them. Finally, unscrew the last Torx Plus ® size 6 screw.



10. Gently, open the LCD connector with the SS-93 and remove the LCD MODULE and the LCD SHIELD ASSY.



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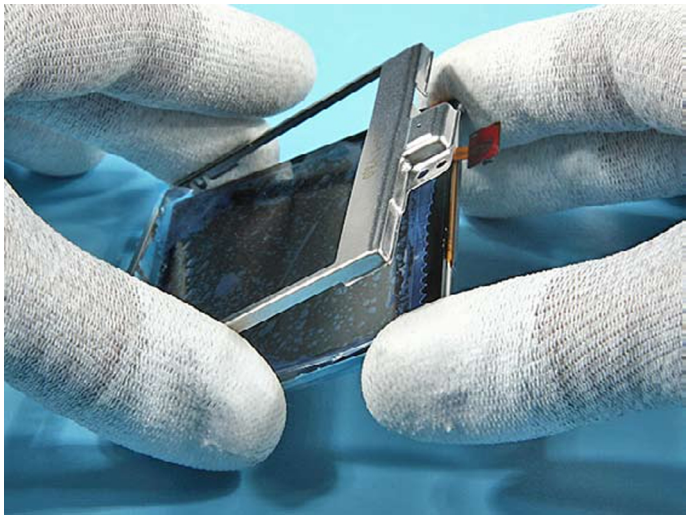
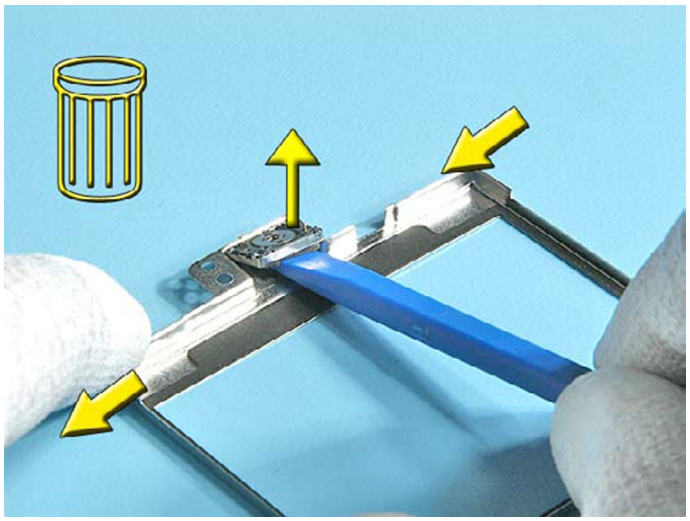
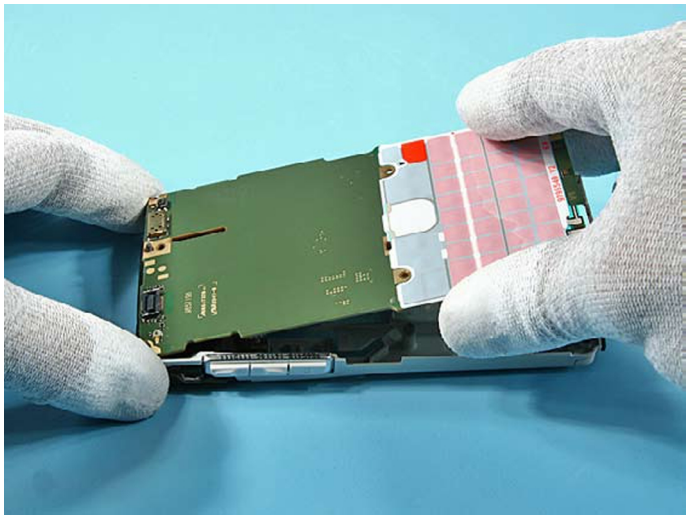
11. Separate the LCD SHIELD ASSY from the LCD MODULE.



12. Remove the EARPIECE from the LCD SHIELD ASSY with the SS-93. In case of removing the EARPIECE, the LCD SHIELD ASSY has to be renewed.



13. Remove the 1ZH ENGINE MODULE from the CHASSIS. After that, the ANTENNA ASSY can remove easily.



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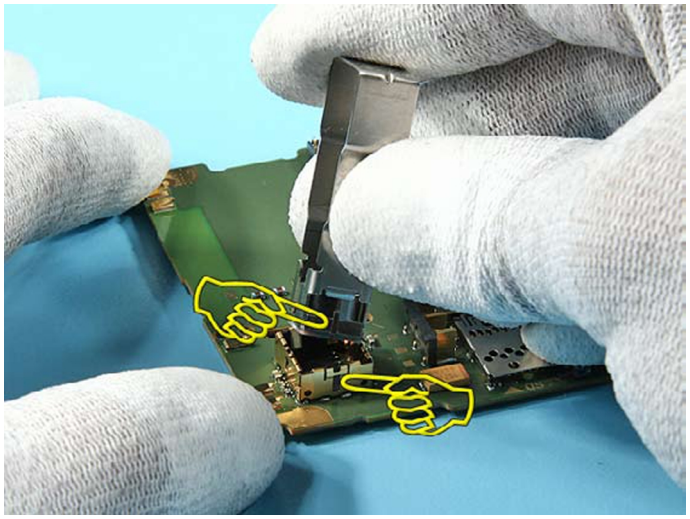
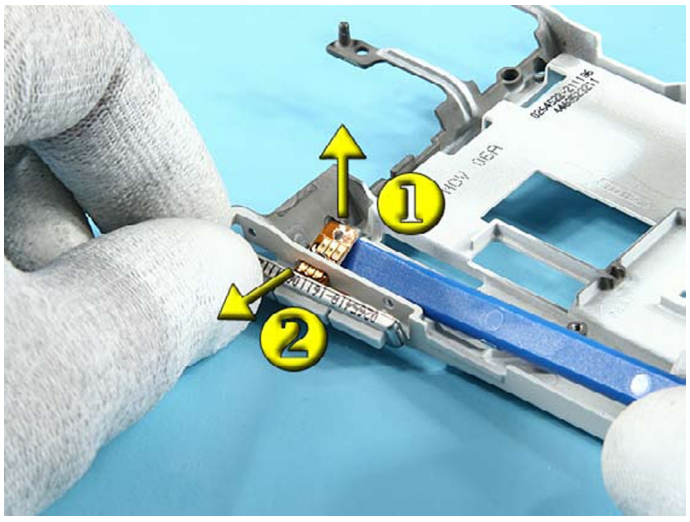
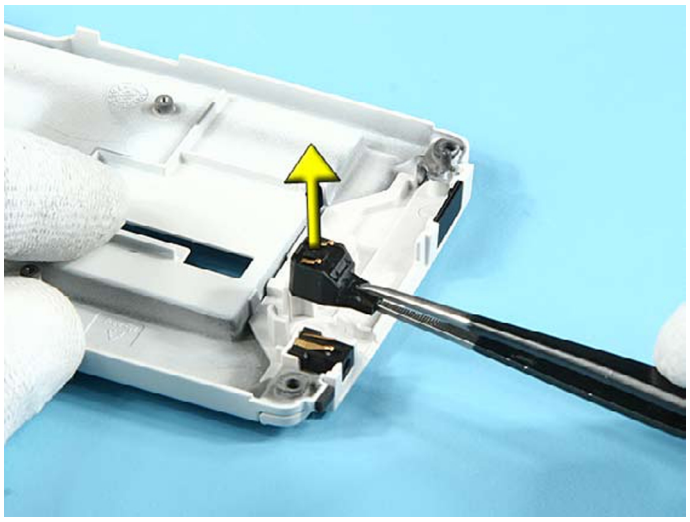
14. Remove the CAMERA with SS-102.



15. Unlock the SIDE BUTTON MODULE ASSY and remove it from its socket.



16. Remove the MICROPHONE.



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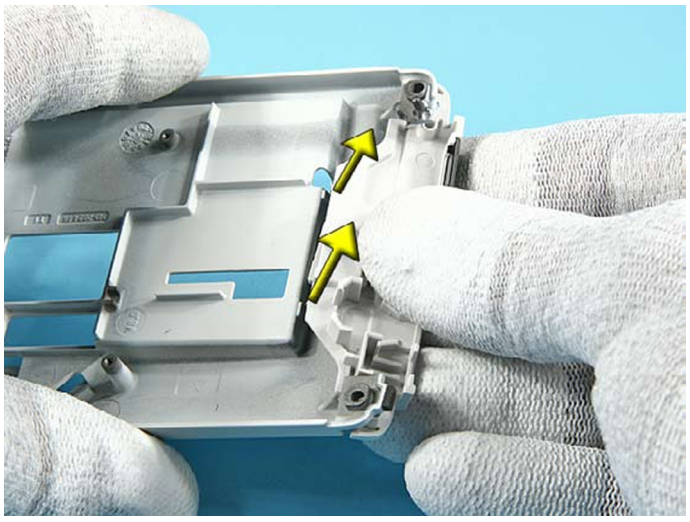
17. Use the DC-PLUG to remove the DC-JACK.

18. Unlock both snaps of the CONNECTOR HOUSING ASSEMBLY and remove it.



19. Remove the BATTERY RELEASE BUTTON and the BATTERY RELEASE SPRING.

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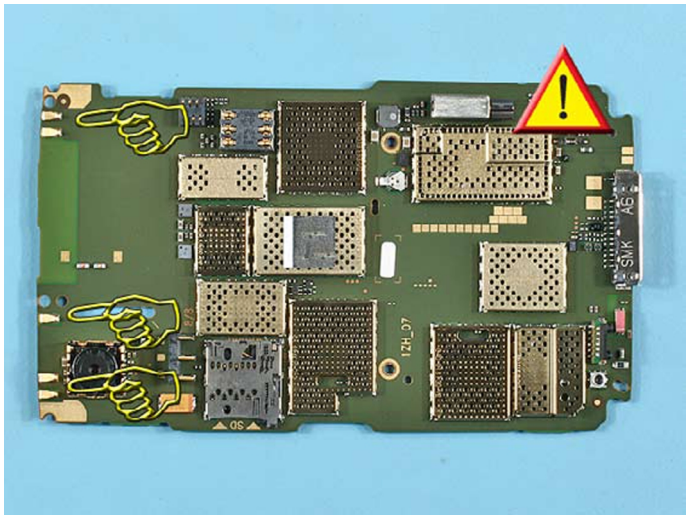
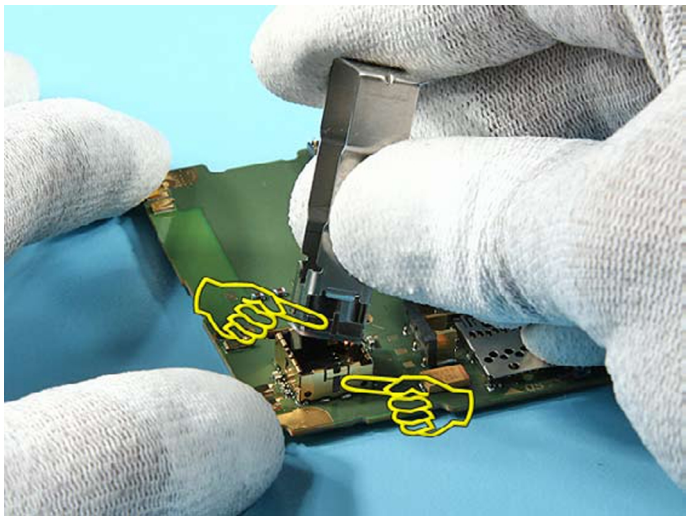
Reassembly hints

Steps

1. Take special care to all spring contacts on the ENGINE MODULE when assembling the unit.



2. Note the right position of the guide pin when assembling the CAMERA.



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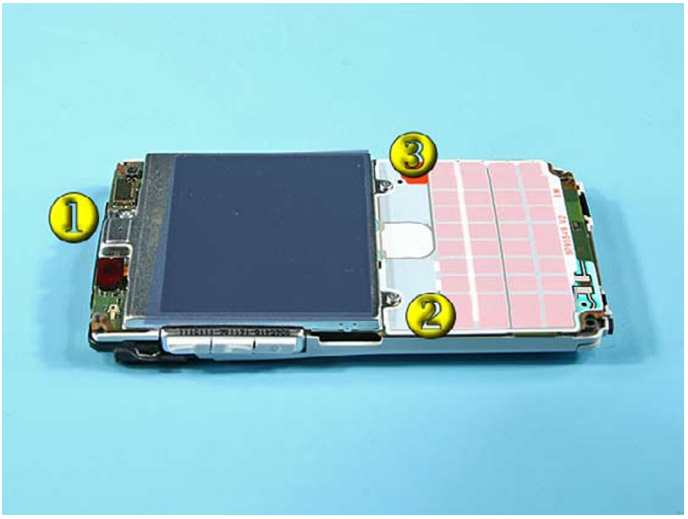
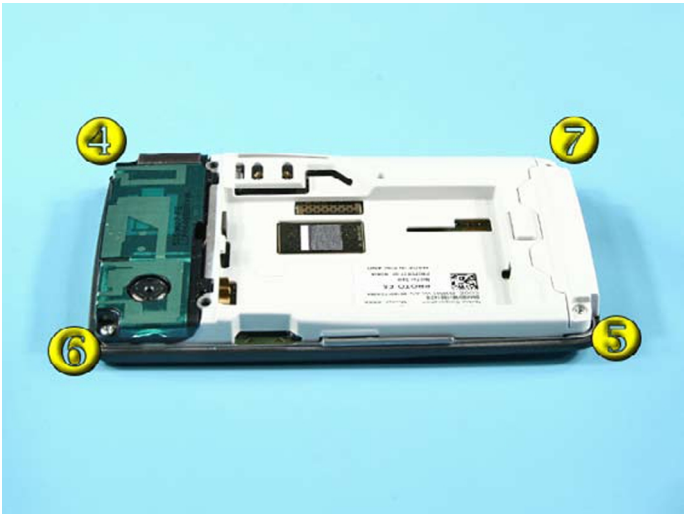
3. Insert the first screw. To avoid damaging the plastic thread, first turn the screw slightly left to engage the thread and then tighten the Torx Plus ® size 6 screw to the torque of 20 Ncm. Always use a new screws 2 and 3. Tighten the Torx Plus ® size 4 screw to the torque of 17 Ncm.



4. Always use new screws. Tighten the four Torx Plus ® size 6 screws to the torque of 17 Ncm in the order shown.



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6 — BB Troubleshooting and Manual Tuning Guide

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Baseband troubleshooting

Context

This section is intended to be a guide for localising and repairing electrical faults. The fault repairing is divided into troubleshooting paths. The following main troubleshooting tree describes the different baseband troubleshooting paths to be followed in fault situations.

Soldered metal shieldings and components below them are not allowed to be changed or removed. The purpose of the following troubleshooting document is only to identify possible BB faults and advice how to tune the phone if it is necessary.

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Troubleshooting flow

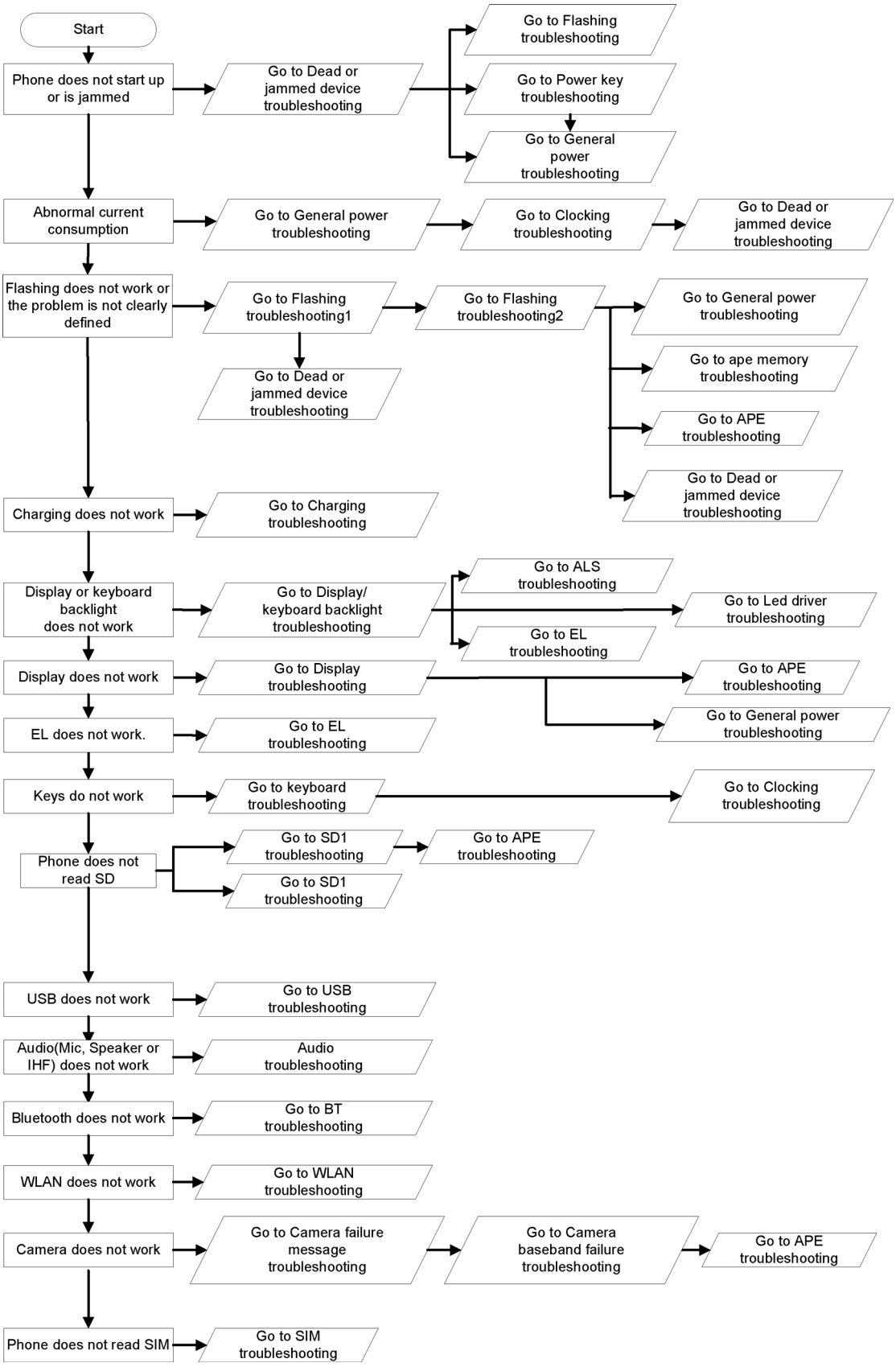

Figure 34 Main troubleshooting tree

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Troubleshooting test point locations

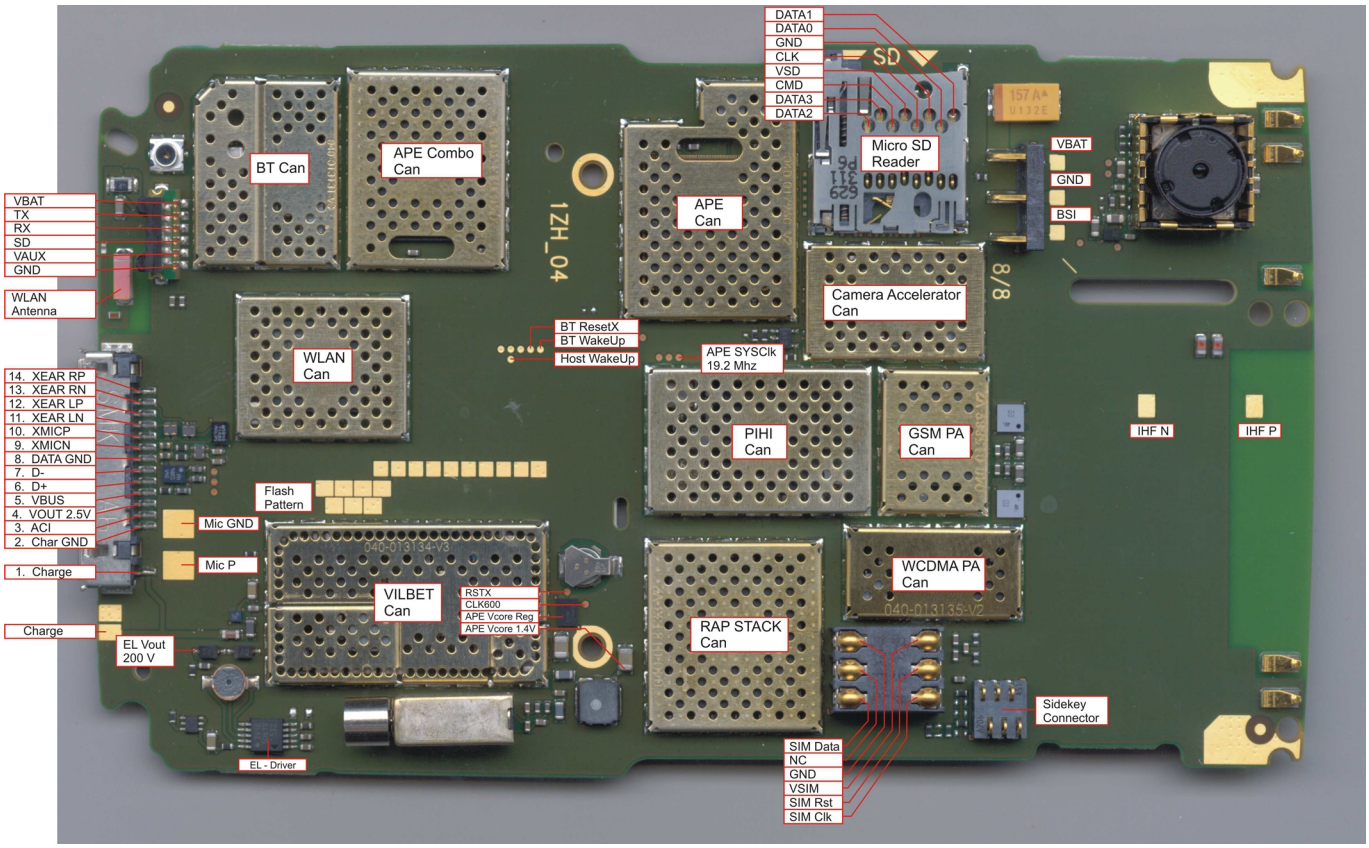

Figure 35 Test point locations - bot

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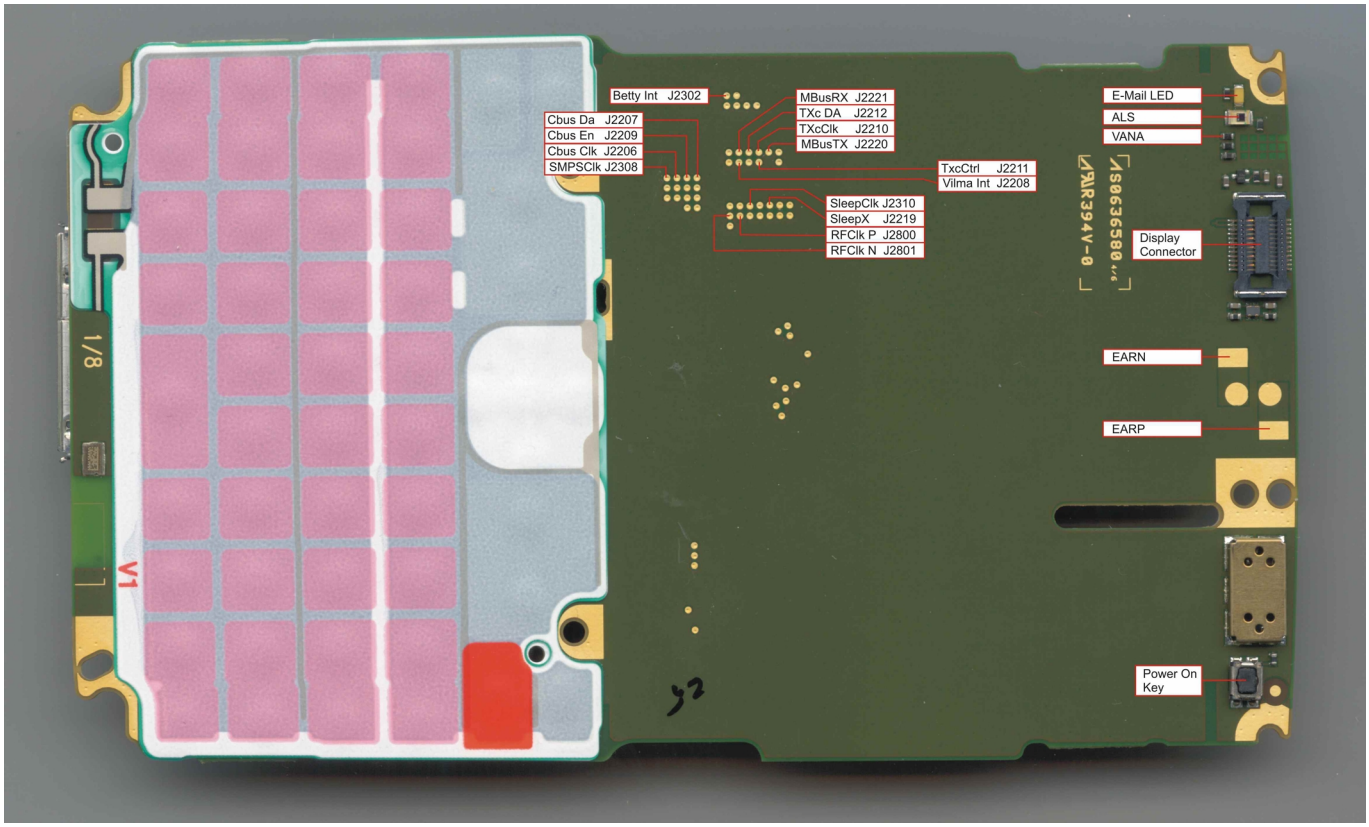

Figure 36 Test point locations - top

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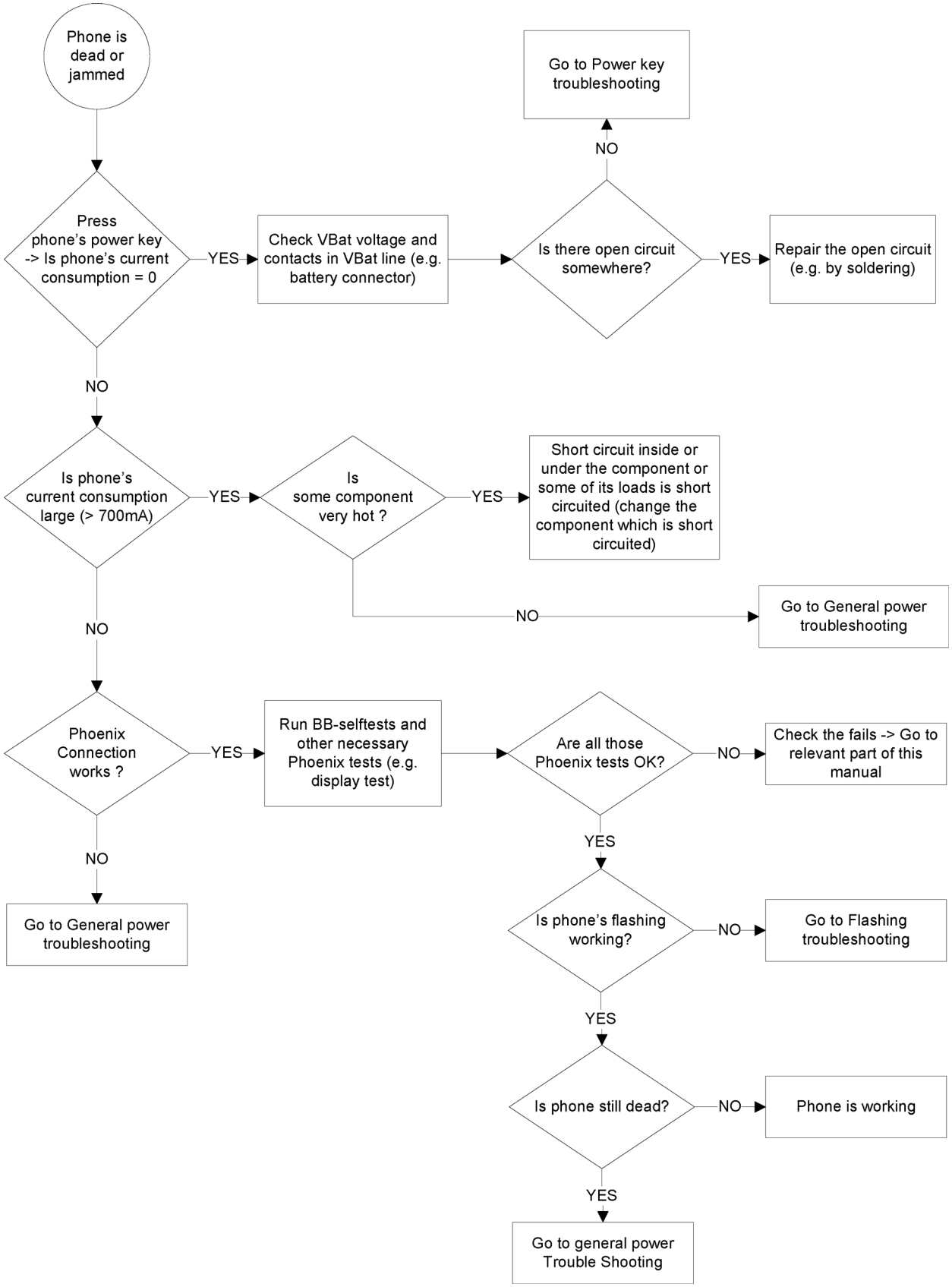
Dead or jammed device troubleshooting

Troubleshooting flow



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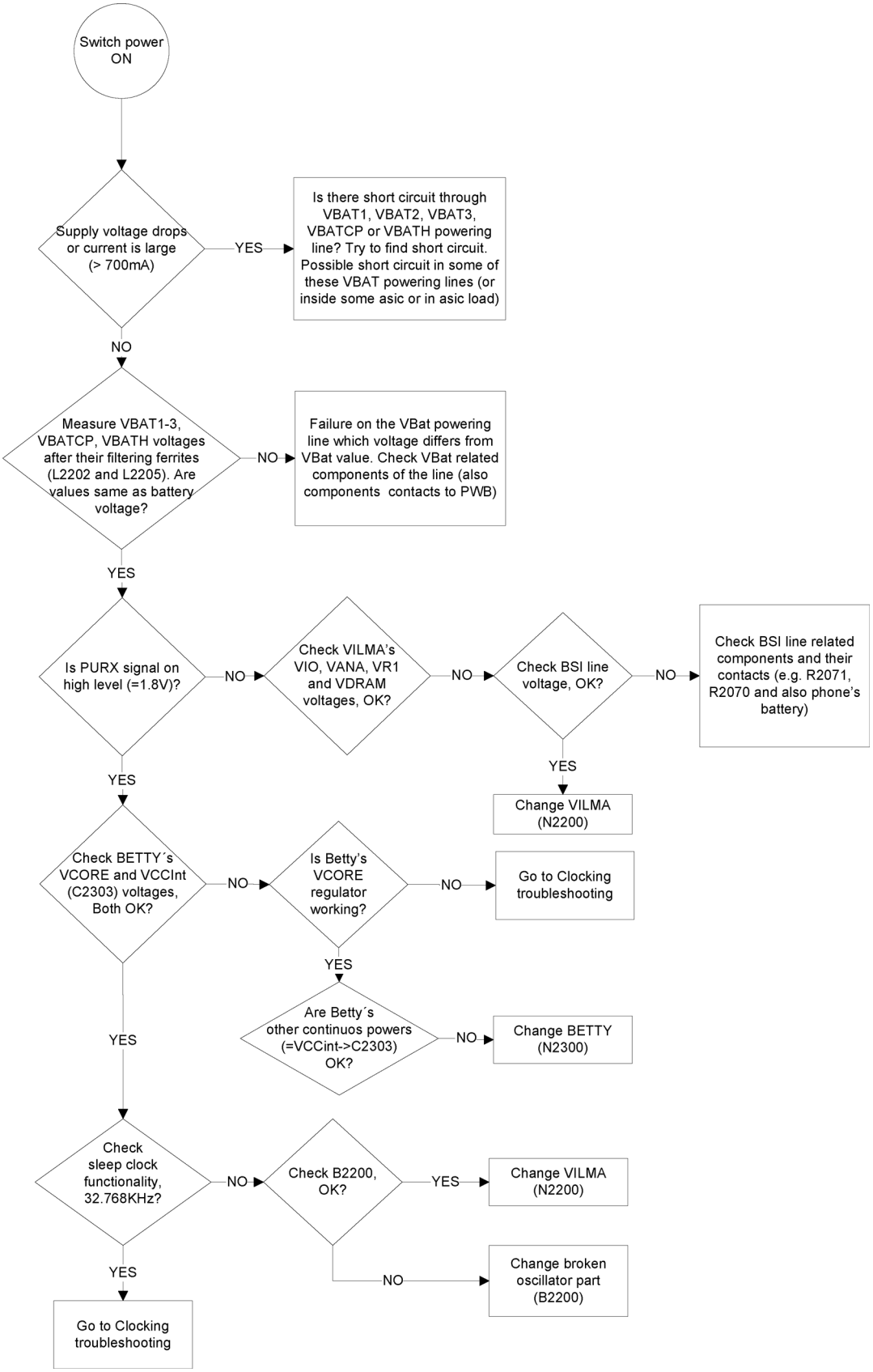
General power checking troubleshooting

Troubleshooting flow



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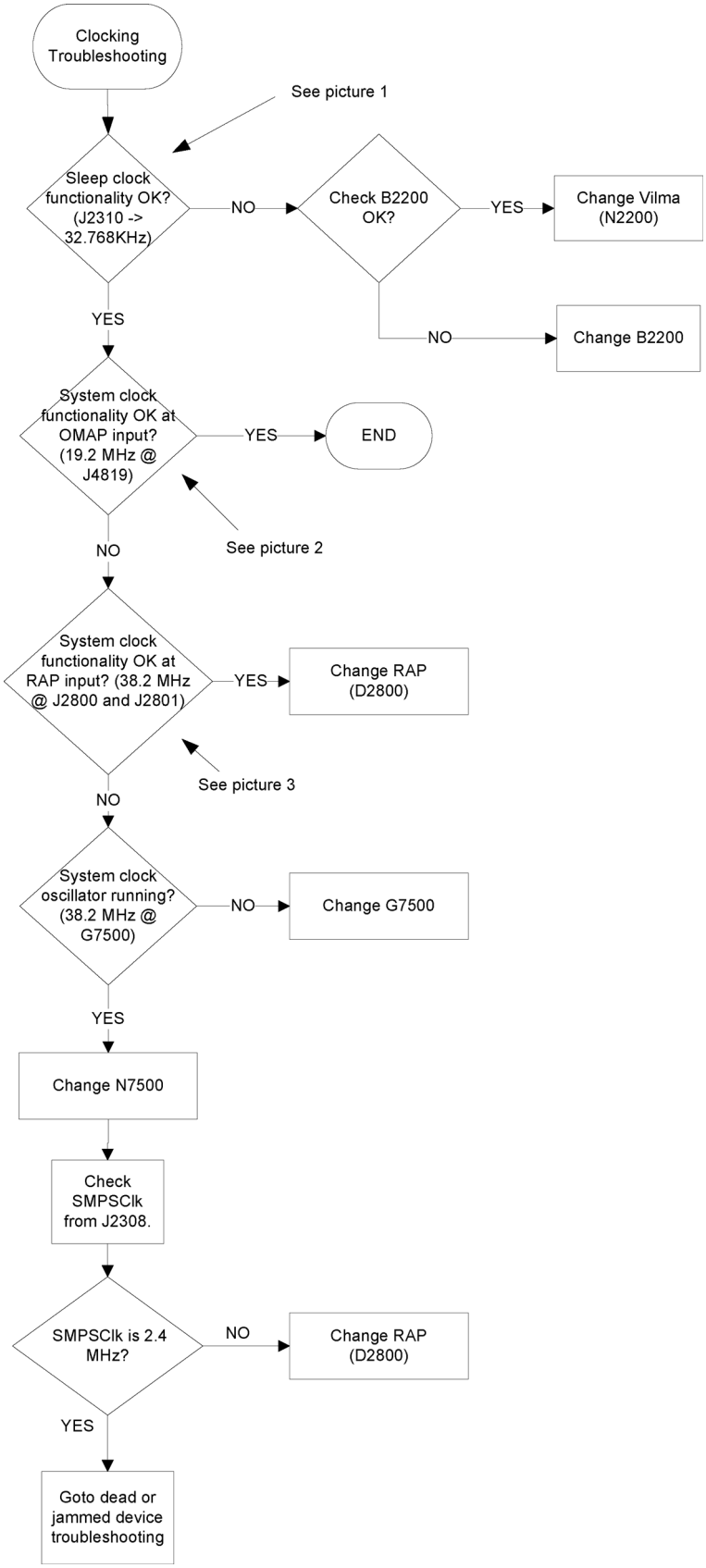
Clocking troubleshooting

Troubleshooting flow



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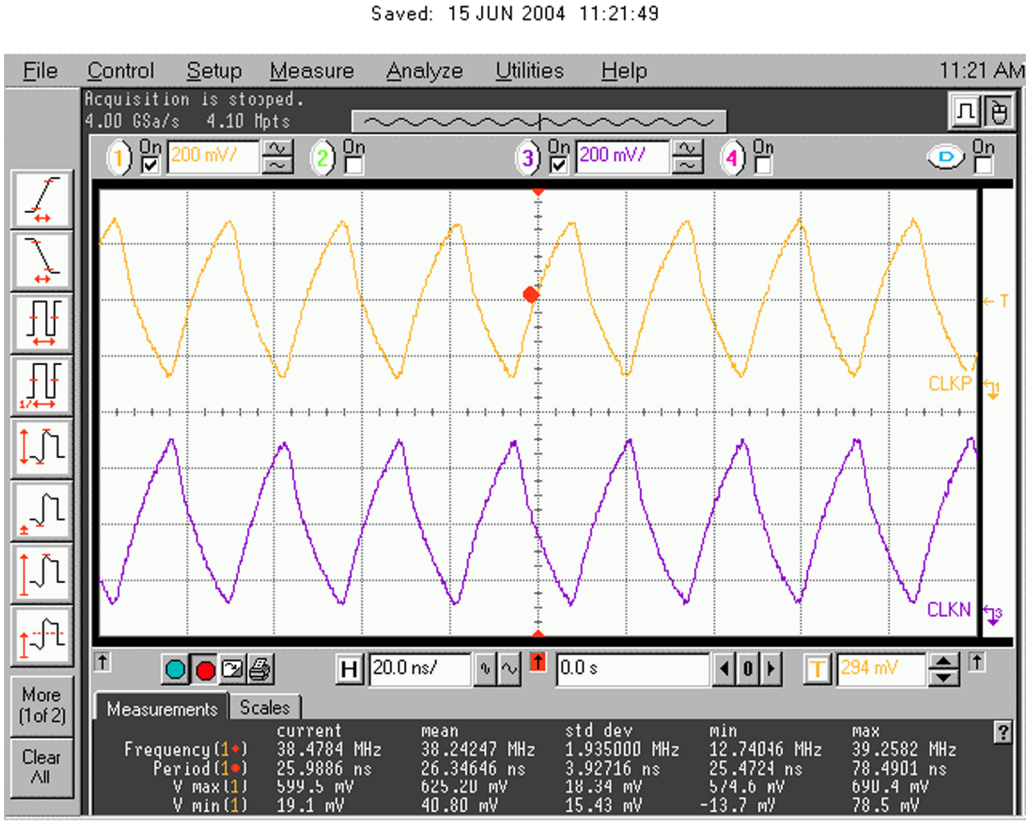

Figure 37 SysCLK from J2800 and J2801

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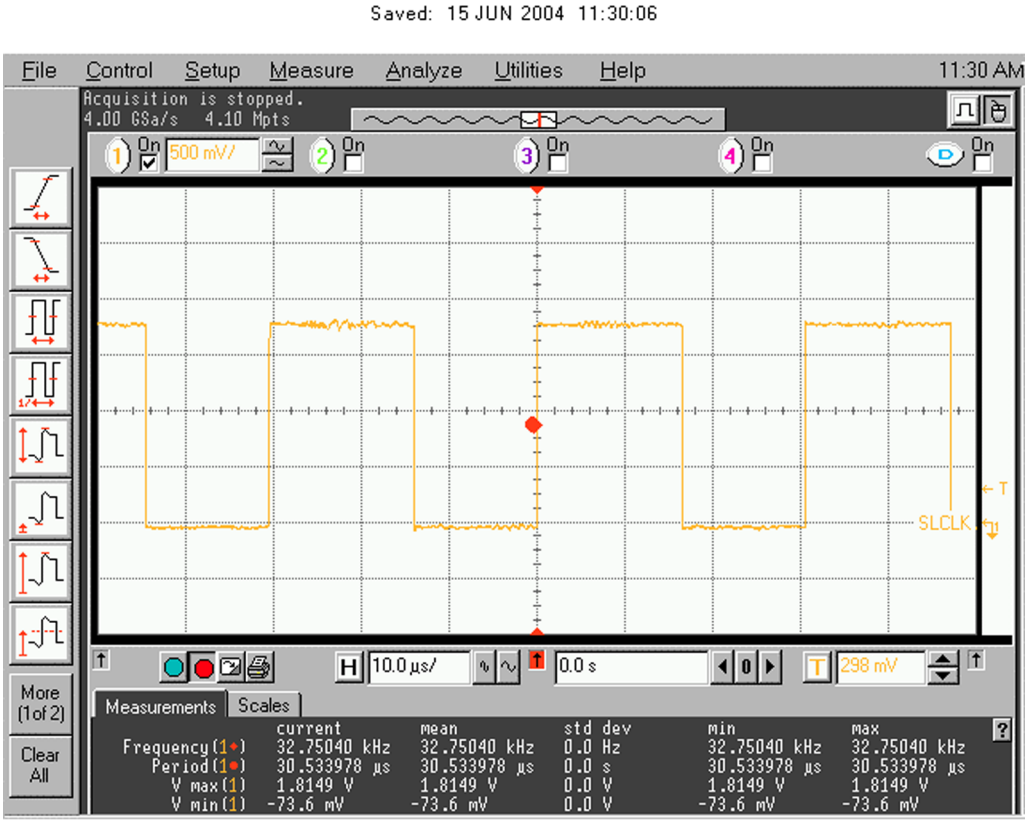

Figure 38 SleepCLK from J2310

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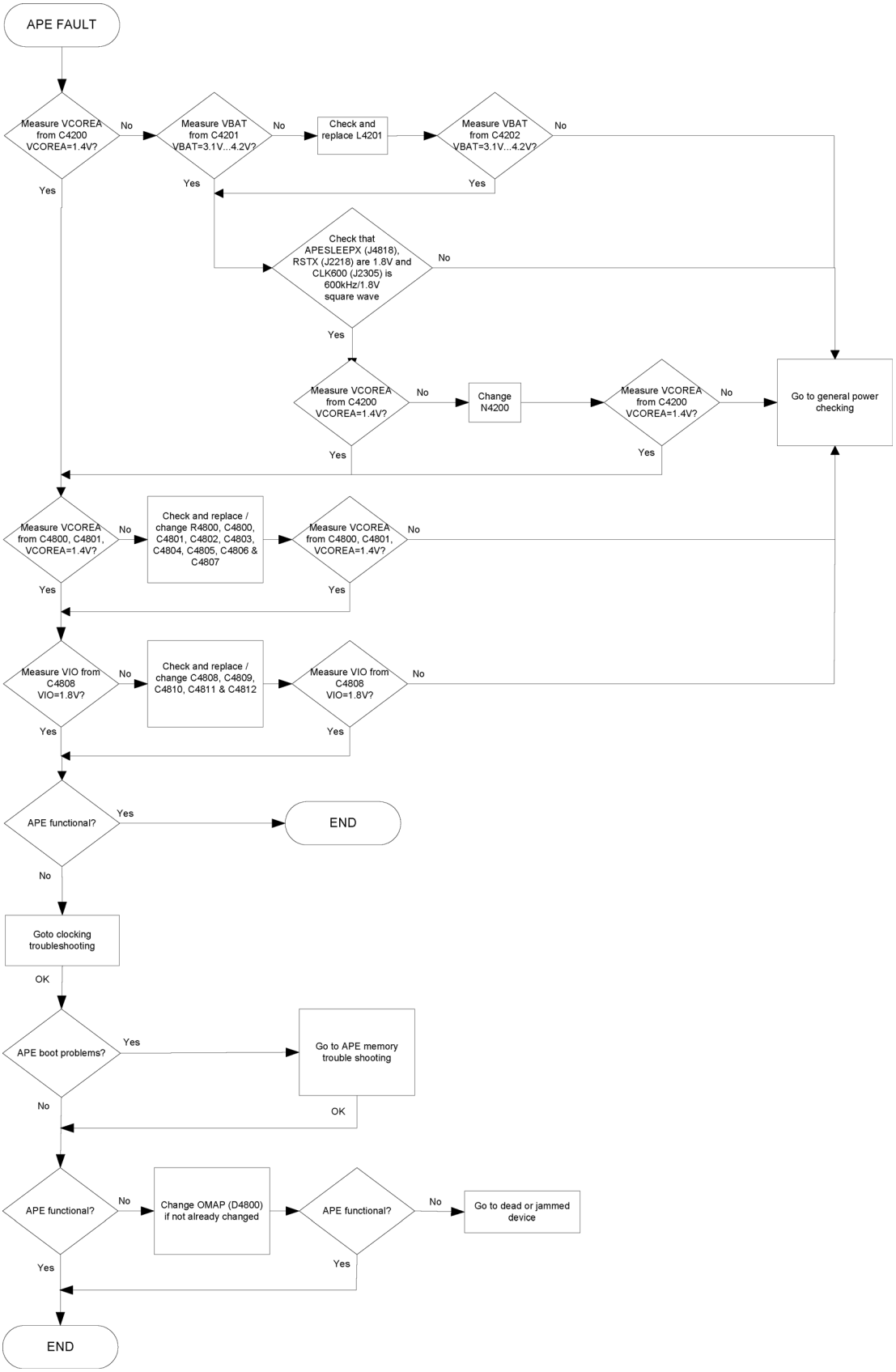
APE troubleshooting

Troubleshooting flow



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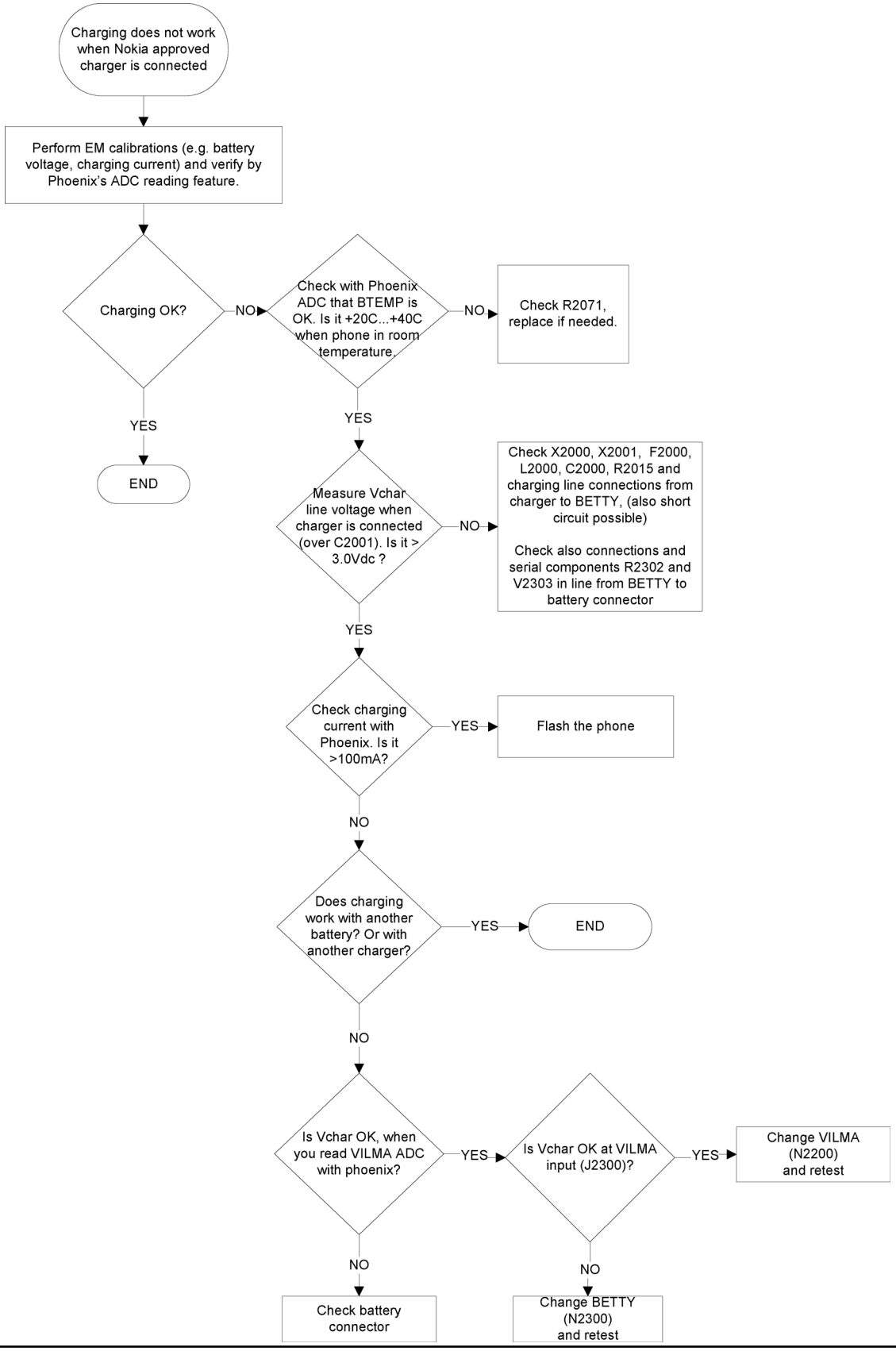
Charging troubleshooting

Troubleshooting flow



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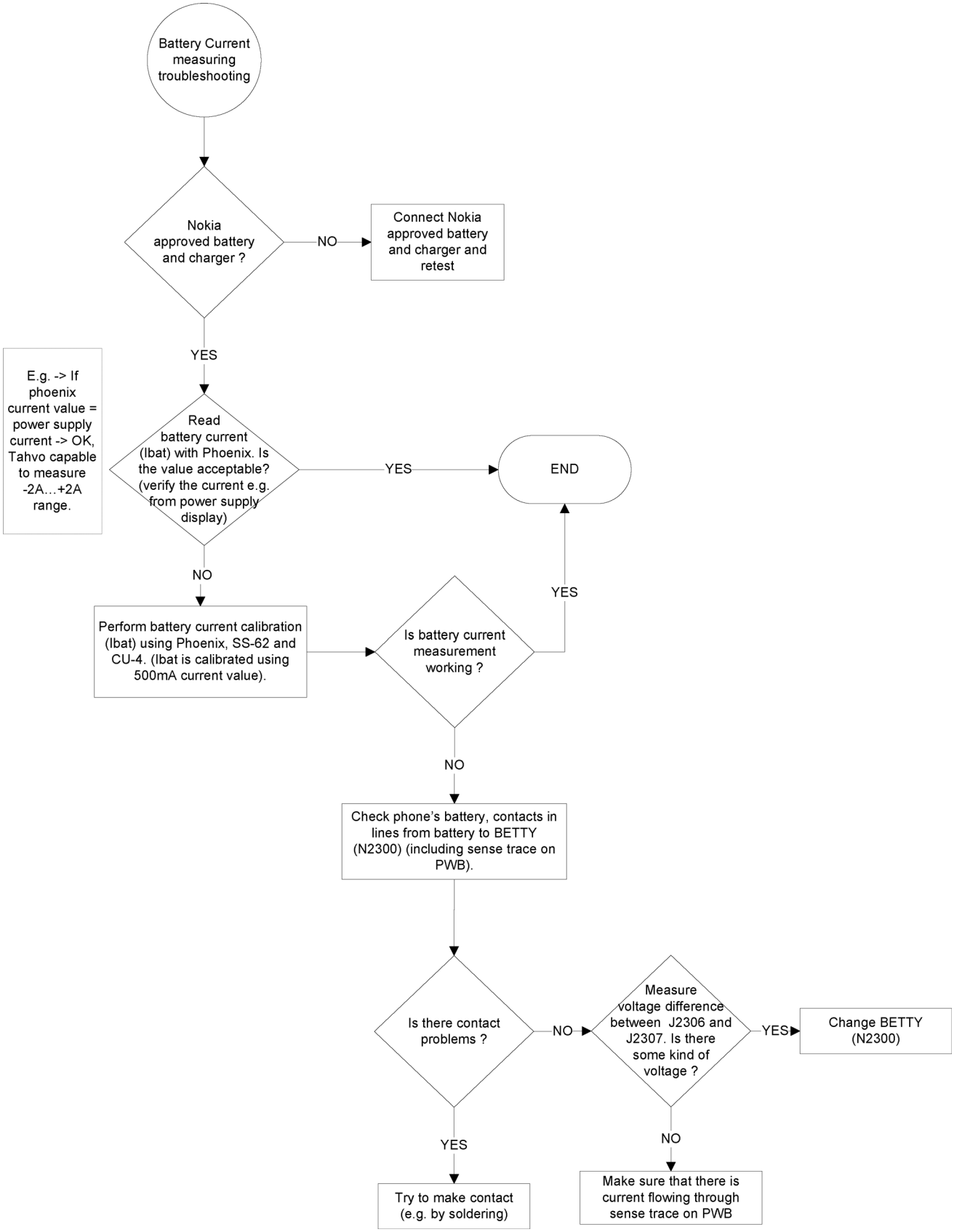
Battery current measuring fault troubleshooting

Troubleshooting flow



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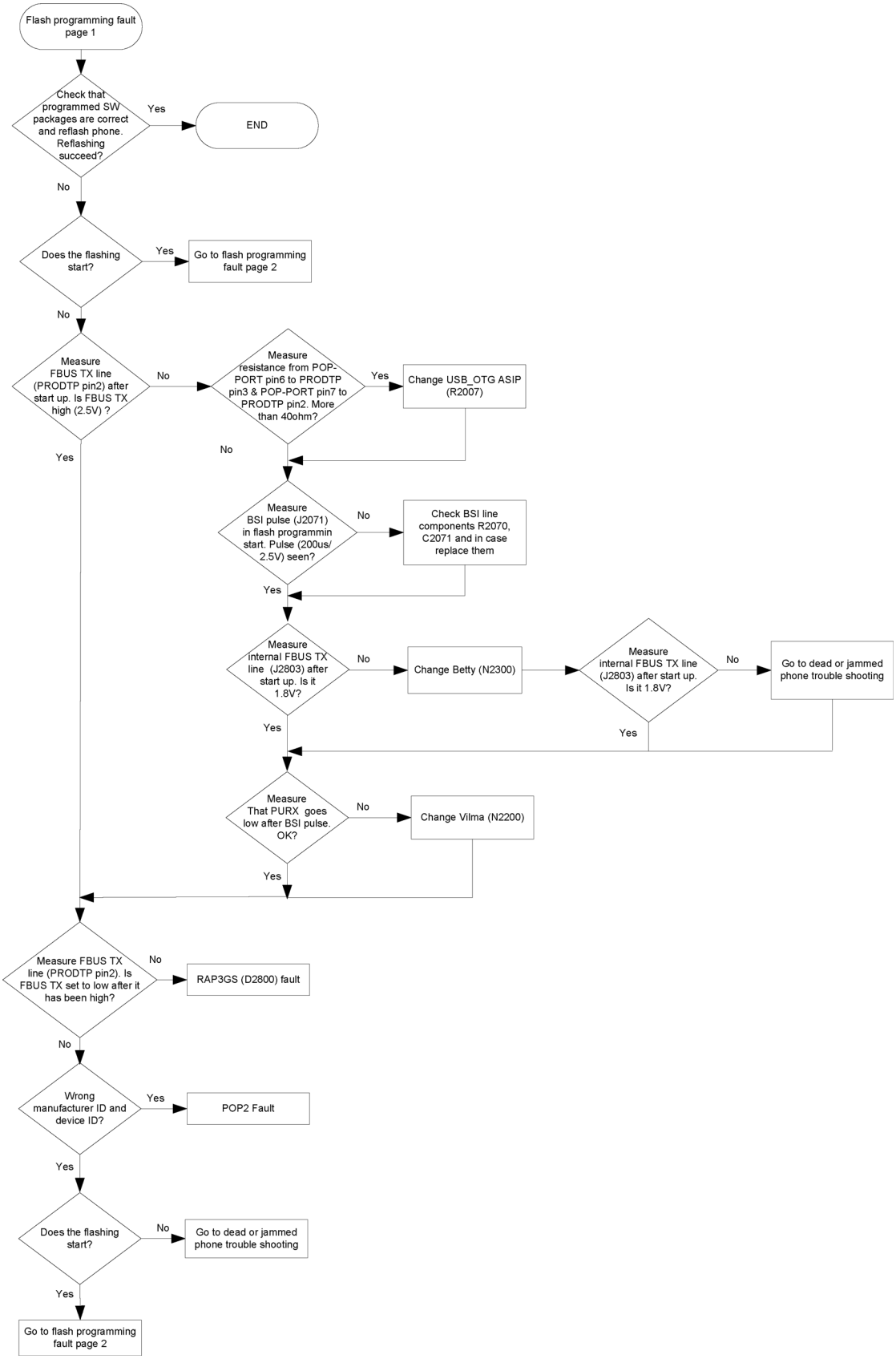
Flash programming fault troubleshooting

Troubleshooting flow



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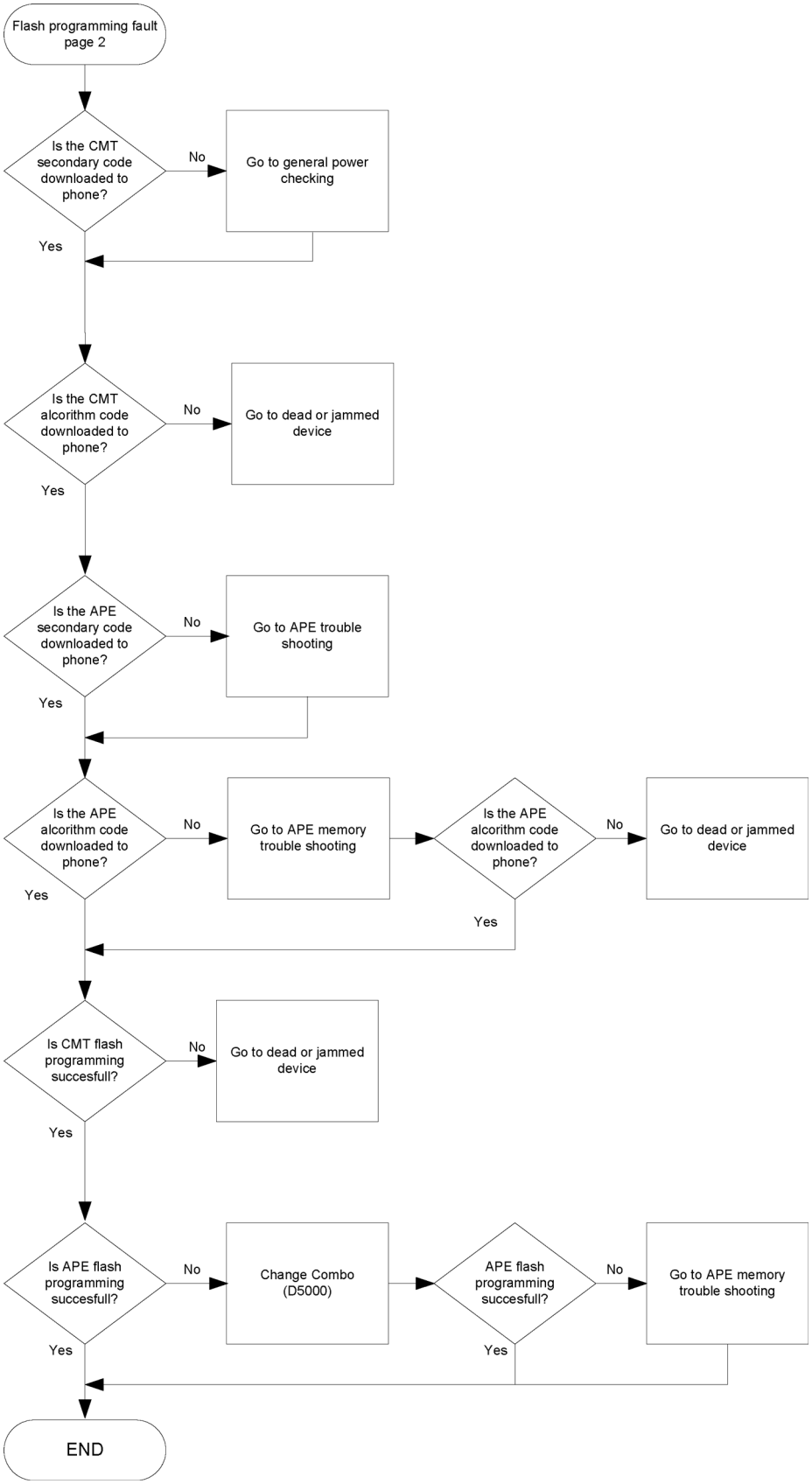

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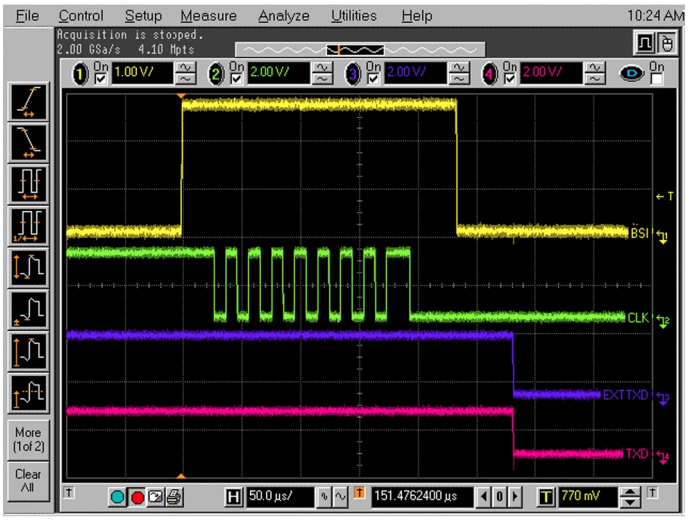

Figure 39 Flashing pic 1. Take single trig measurement for the rise of the BSI signal.

Saved: 05 JUL 2004 13:24:19

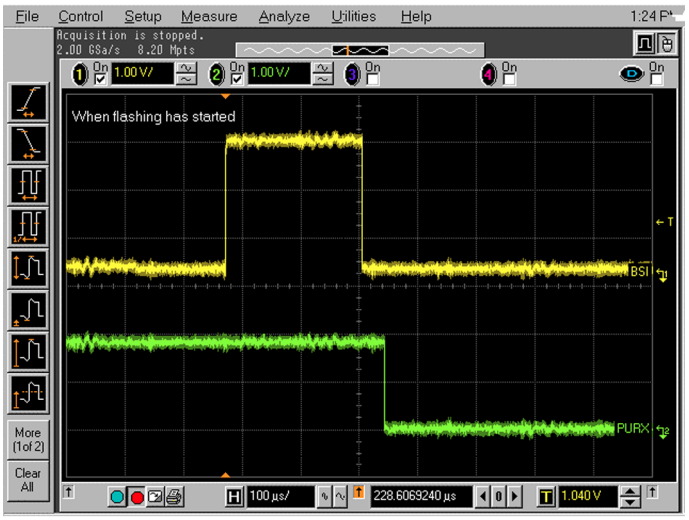

Figure 40 Flashing pic 2. Take single trig measurement for the rise of the BSI signal.

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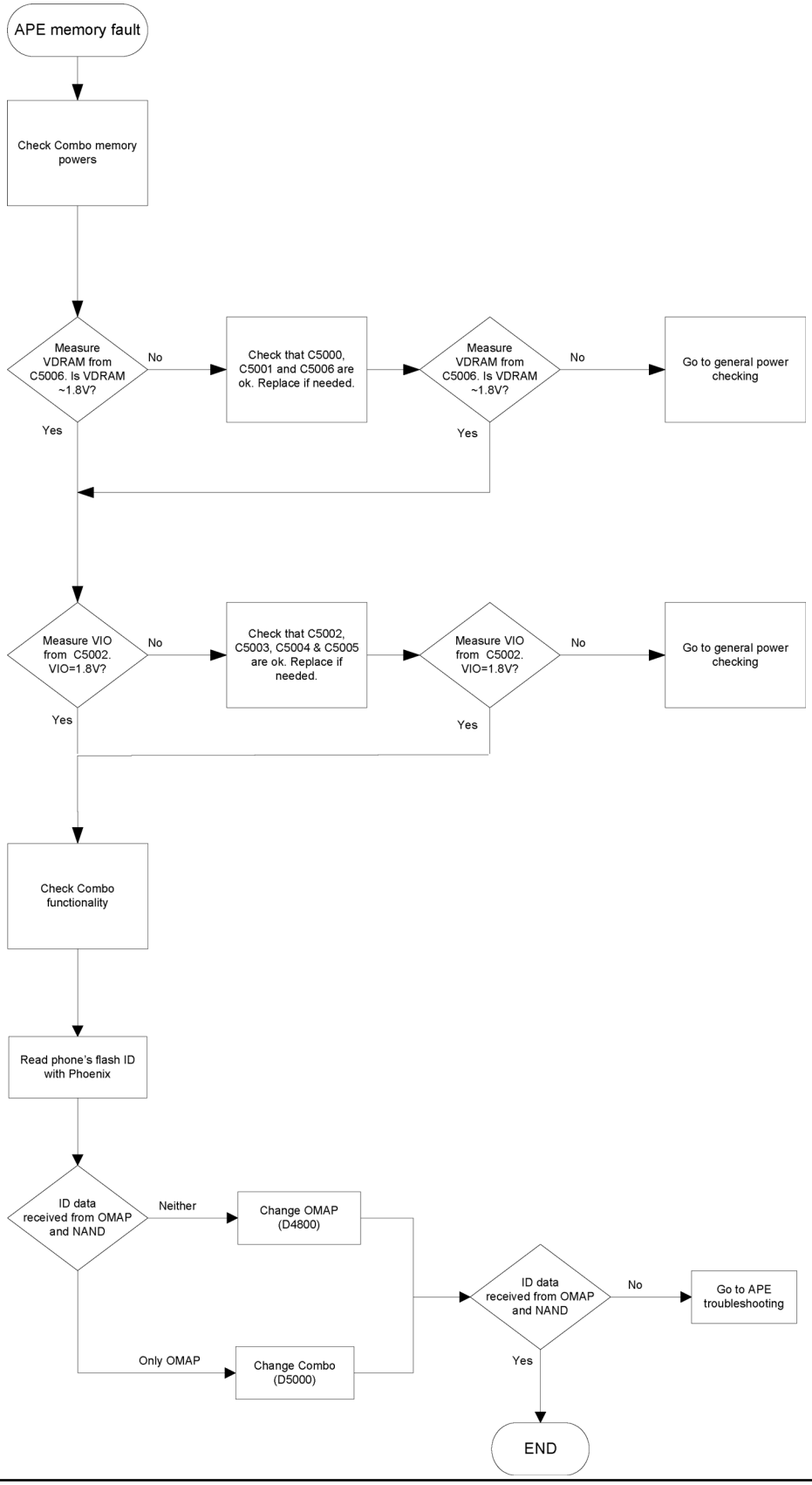
APE memory troubleshooting

Troubleshooting flow



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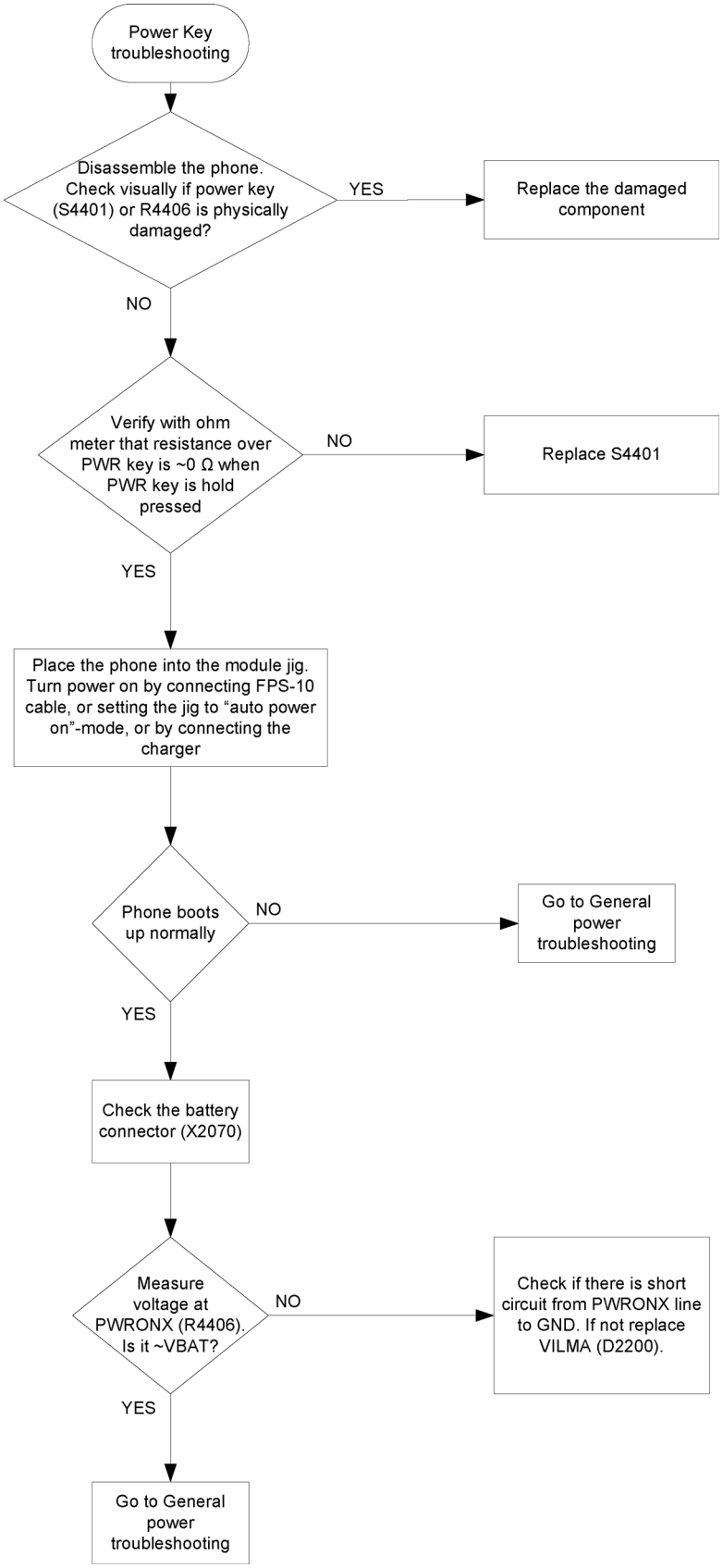
Power key troubleshooting

Troubleshooting flow



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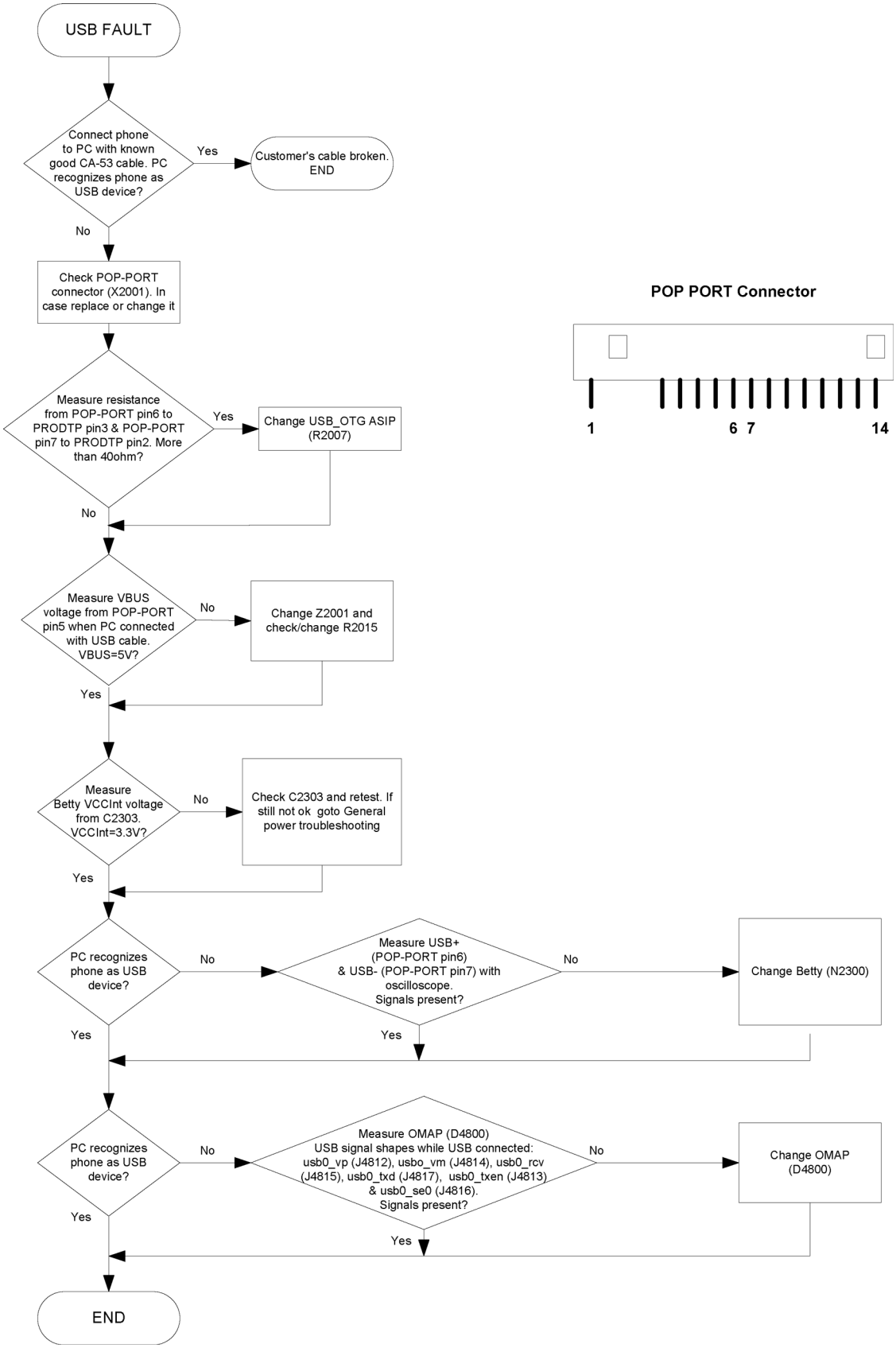
USB interface troubleshooting

Troubleshooting flow



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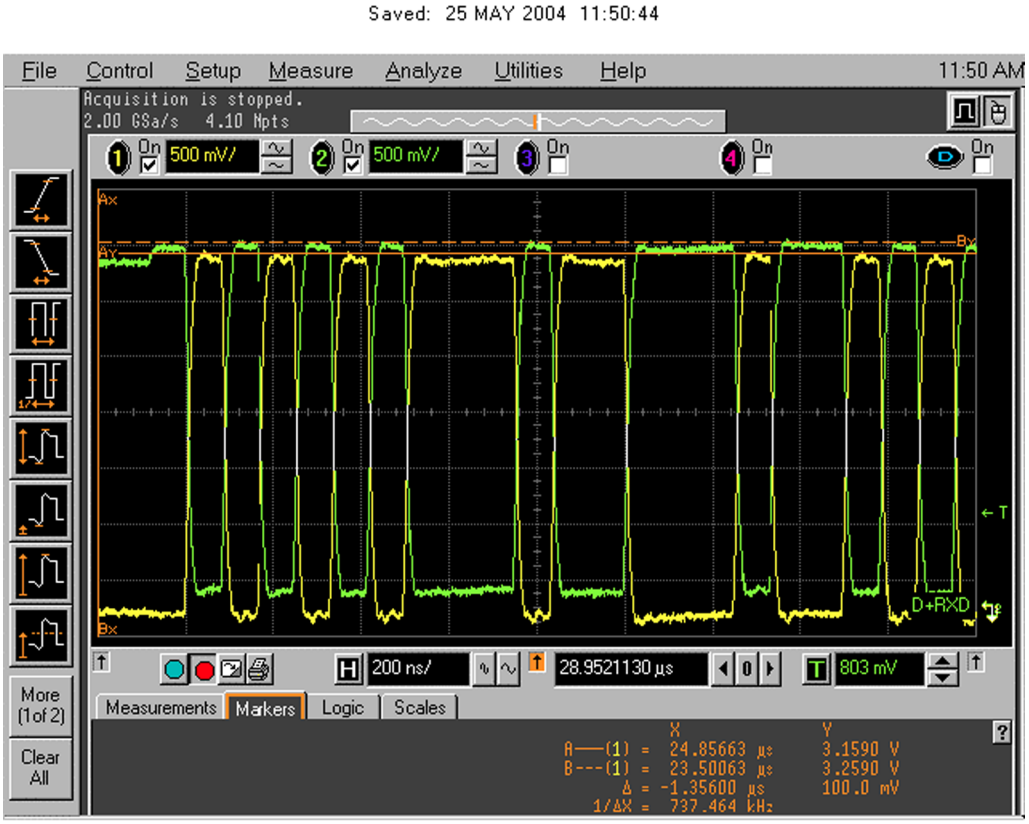

Figure 41 USB 1: D-TXD (POP-PORT pin6) and D+RXD (POP-PORT pin7) voltage levels when USB connected.

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Figure 42 USB 2: Take single triggered measurement on the rising edge of the Helen usb0_txen (J4813) line.

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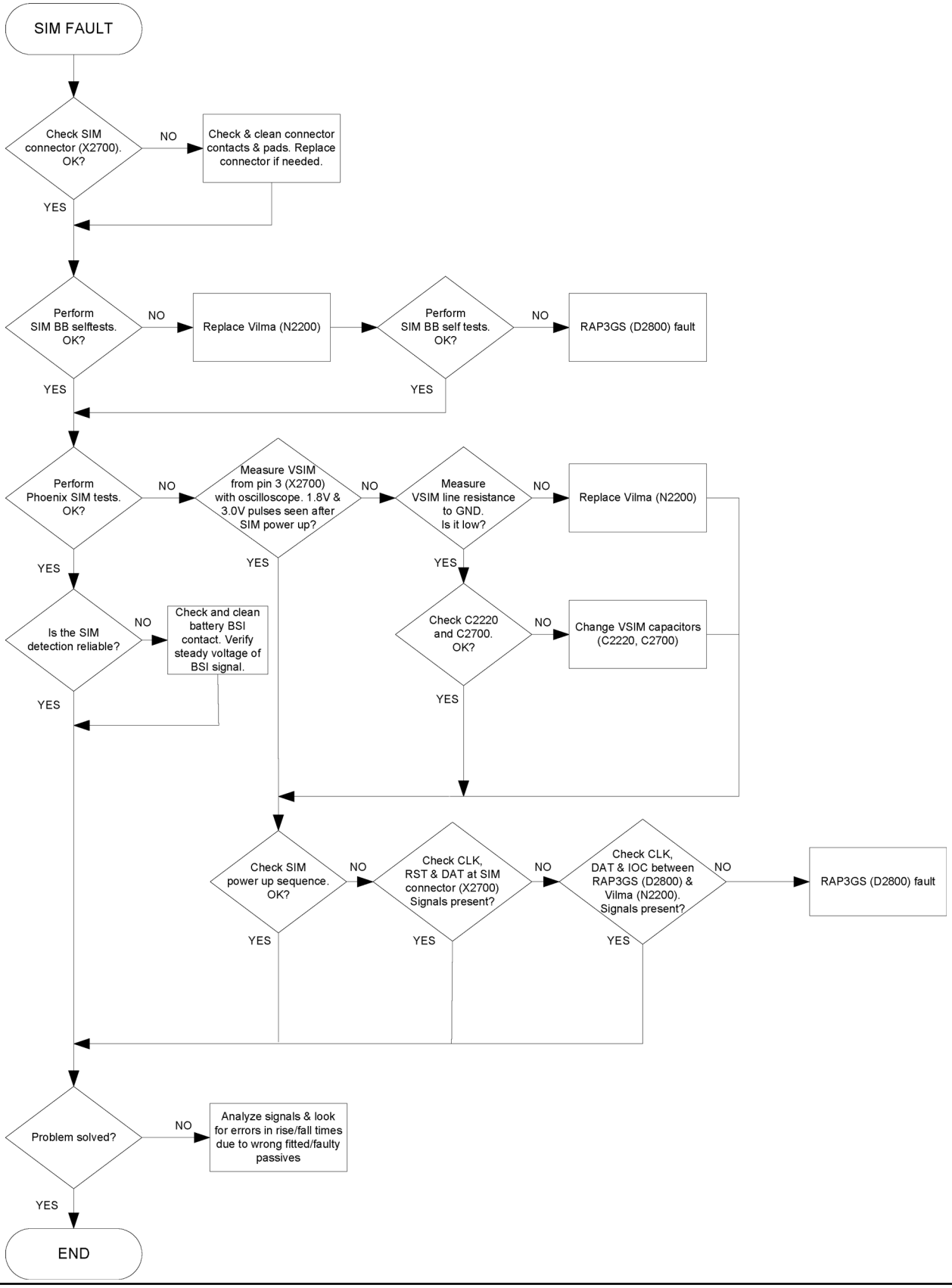
SIM card troubleshooting

Troubleshooting flow



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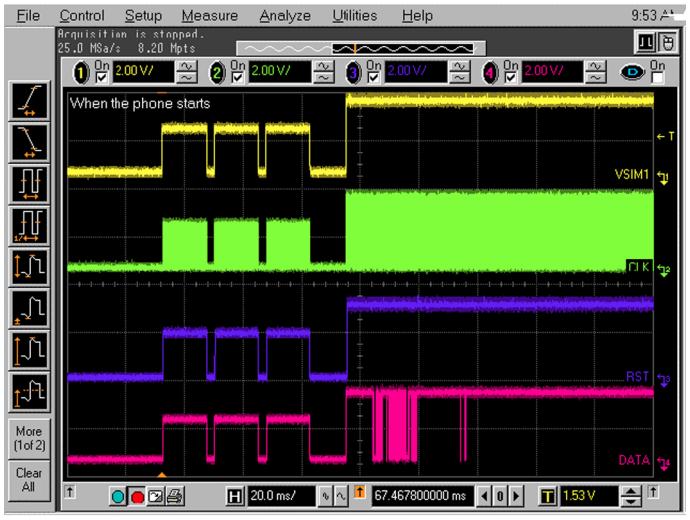

SIM CLK frequency = 3.2MHz (Take single triggered measurement in boot on the VSIM1 line).

Figure 43 SIM interface signals

Keyboard troubleshooting

Context

There are two possible failure modes in the keyboard module:

- One or more keys can be stuck, so that the key does not react when a keydome is pressed. This kind of failure is caused by mechanical reasons (dirt, corrosion).
- Malfunction of several keys at the same time; this happens when one or more rows or columns are faulty (shortcut or open connection). For a more detailed description of the keyboard and keymatrix, see section **Keyboard** in **System Module**.

If the failure mode is not clear, start with the **Keyboard Test** in *Phoenix*.

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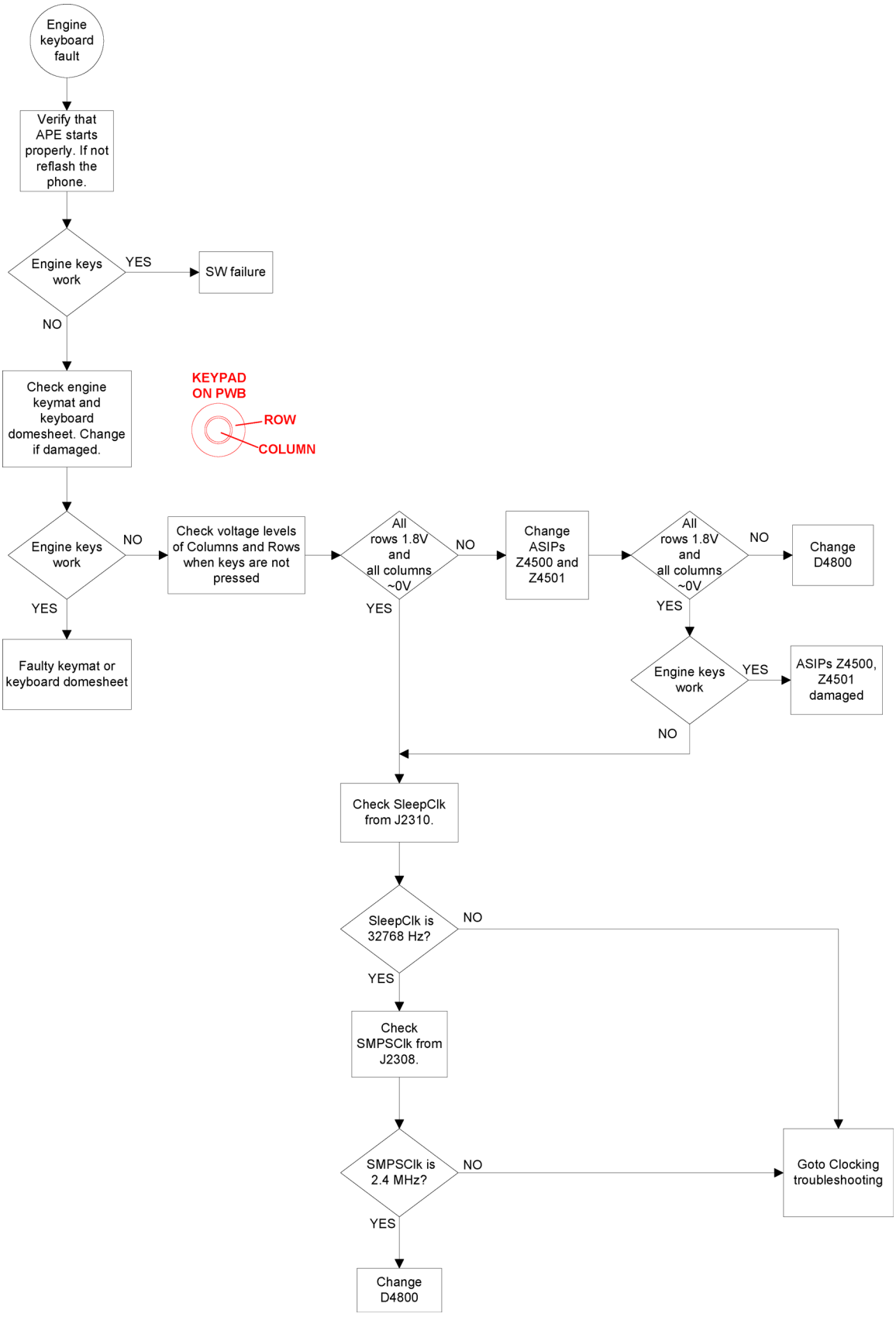
Troubleshooting flow



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Certificate restoring for BB5 products

Context

This procedure is performed when the device certificate is corrupted for some reason.

All tunings (RF & Baseband, UI) must be done after performing the certificate restoring procedure.

The procedure for certificate restoring is the following:

- Flash the phone with the latest available software using FPS-8 or FPS-10.

  Note: USB flashing does not work for a dead BB5 phone.
- Create a request file.
- Send the file to Nokia by e-mail. Use the following addresses depending on your location:
  - APAC: sydney.service@nokia.com
  - CHINA: repair.ams@nokia.com
  - E&A: salo.repair@nokia.com
  - AMERICAS: fls1.usa@nokia.com
- When you receive a reply from Nokia, carry out certificate restoring.
- Tune the phone completely.

  Note: SX-4 smart card is needed.
- If the phone resets after certificate restoring, reflash the phone again.

Required equipment and setup:

- *Phoenix* service software v 2004.39.7.70 or newer.
- The latest phone model specific *Phoenix* data package.
- PKD-1 dongle
- SX-4 smart card (Enables BB5 testing and tuning features)
- External smart card reader

  Note: The smart card reader is only needed when FPS-8 is used. FPS-10 has an integrated smart card reader.
- Activated FPS-8 flash prommer **OR** FPS-10 flash prommer
- Flash update package 03.18.004 or newer for FPS-8 or FPS-10 flash prommers
- CU-4 control unit
- USB cable from PC USB Port to CU-4 control unit
- Phone model specific adapter for CU-4 control unit
- PCS-1 cable to power CU-4 from external power supply
- XCS-4 modular cable between flash prommer and CU-4

  Note: CU-4 must be supplied with +12 V from an external power supply in all steps of certificate restoring.

Steps

1. Program the phone software.
   i Start *Phoenix* and login. Make sure the connection has been managed correctly for FPS-8 or FPS-10.
   ii Update the phone MCU software to the latest available version.
   If the new flash is empty and the phone cannot communicate with *Phoenix*, reflash the phone.

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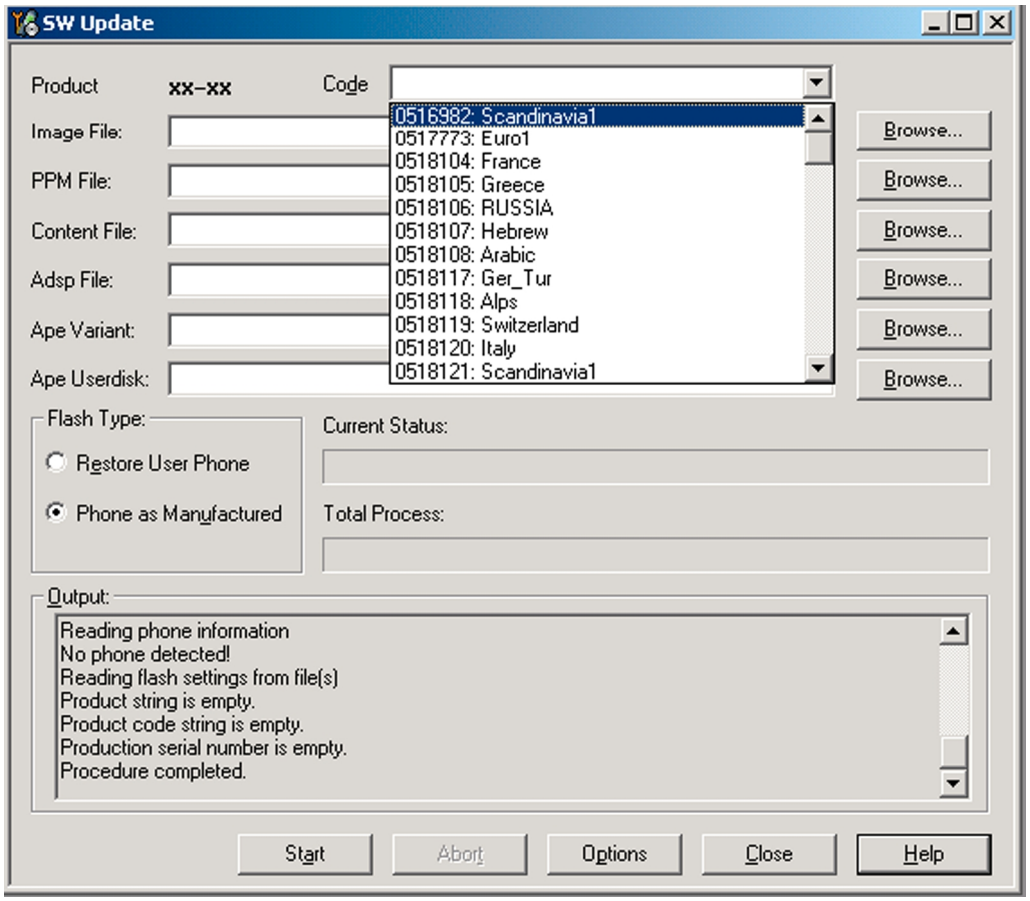
iii Choose the product manually from **File→Open Product** , and click **OK**.

Wait for the phone type designator (e.g. "RM-1") to be displayed in the status bar.

iv Go to **Flashing→SW Update** and wait until *Phoenix* reads the product data as shown in the following picture.



Product	is automatically set according to the phone support module which was opened manually, but the flash files cannot be found because the correct data cannot be read from the phone automatically.
Code	must be chosen manually, it determines the correct flash files to be used. Please choose the correct product code (can be seen in the phone type label) from the dropdown list.
Flash Type	must be set to **Phone as Manufactured**.

v To continue, click **Start**.

Progress bars and messages on the screen show actions during phone programming, please wait.

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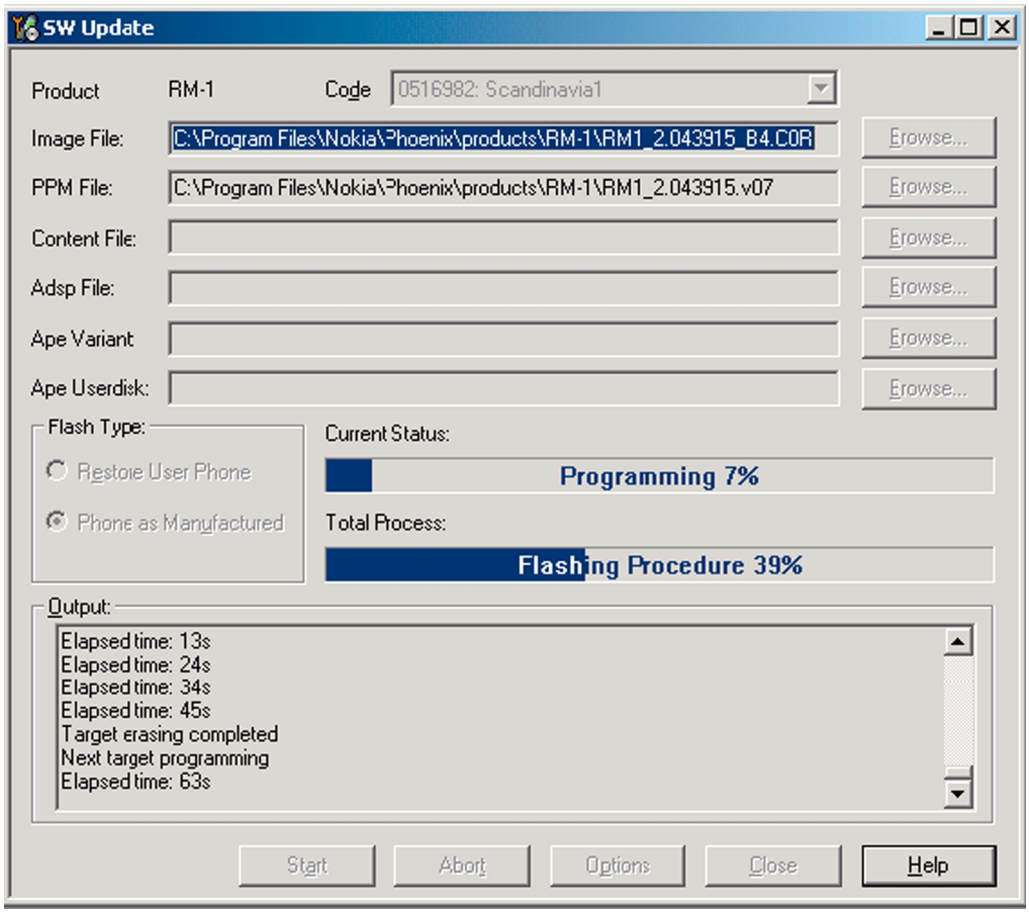


Programming is completed when *Flashing Completed* message is displayed.

The product type designator and MCU SW version are displayed in the status bar.

vi Close the *SW Update* window and then choose **File→Close Product** .

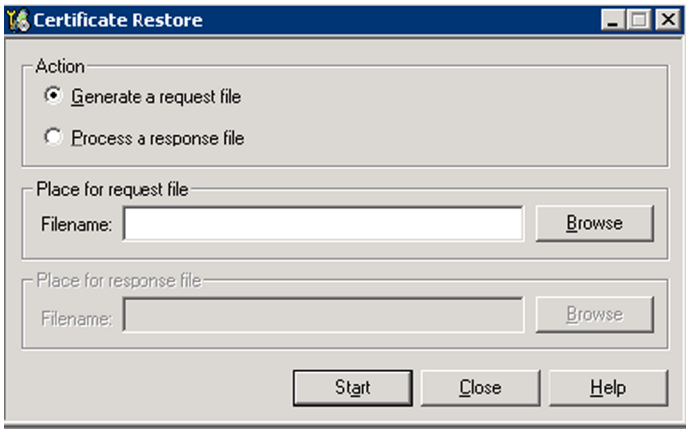
2. Create a *Request* file.

For this procedure, you must supply +12 V to CU-4 from an external power supply.

i To connect the phone with *Phoenix*, choose **File→Scan Product** .

ii Choose **Tools→Certificate Restore** .

iii To choose a location for the request file, click **Browse**.



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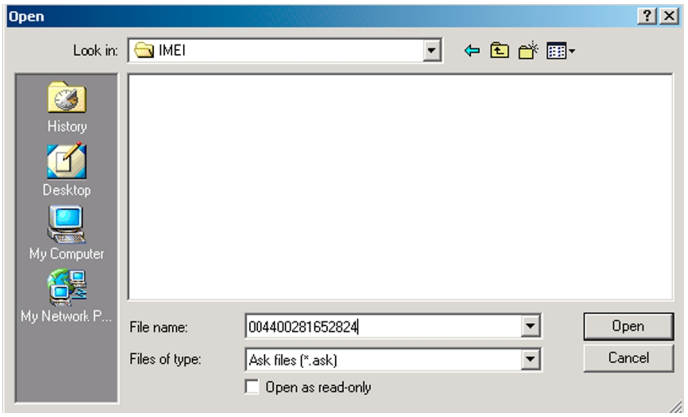
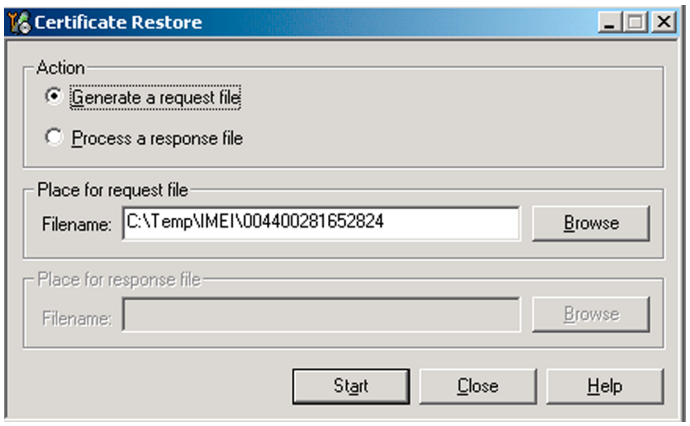
iv Name the file so that you can easily identify it, and click **Open**.



The name of the file and its location are shown.



v To create the *Request* file, click **Start**.

vi When the file for certificate restore has been created, send it to Nokia as an e-mail attachment.

3. Restore certificate.

For this procedure, you must supply +12 V to CU-4 from an external power supply.

i Save the reply file sent by Nokia to your computer.

ii Start *Phoenix* service software.

iii Choose **File→Scan Product** .

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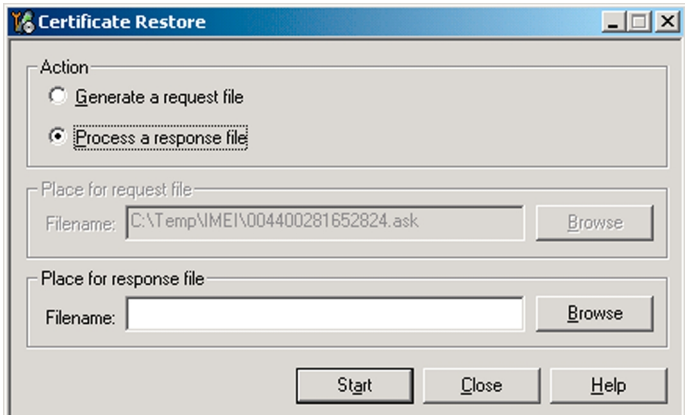
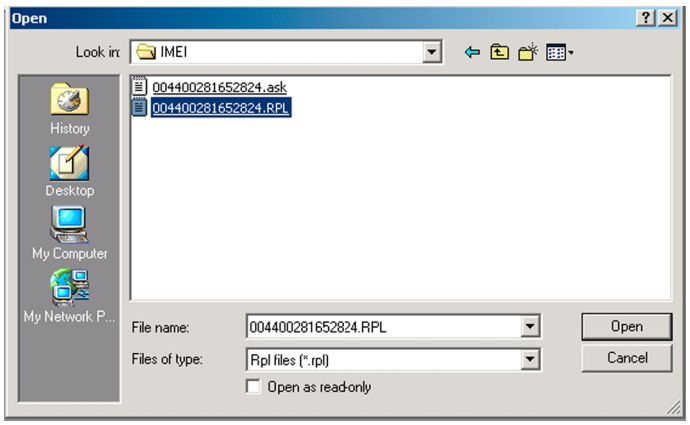
iv From the **Tools** menu, choose **Certificate Restore** and select **Process a response file** in the *Action* pane.



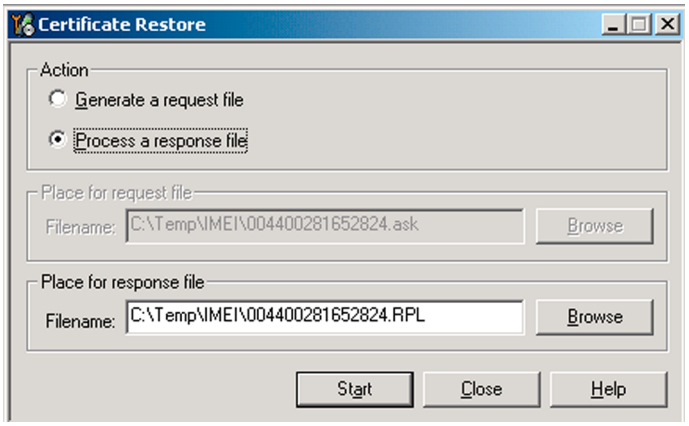
v To choose the location where response file is saved, click **Browse**.

vi Click **Open**.



The name of the file and the path where it is located are shown.

vii To write the file to phone, click **Start**.



Next actions

After a successful rewrite, you must retune the phone completely by using *Phoenix* tuning functions.

Important: Perform all tunings: RF, BB, and UI.

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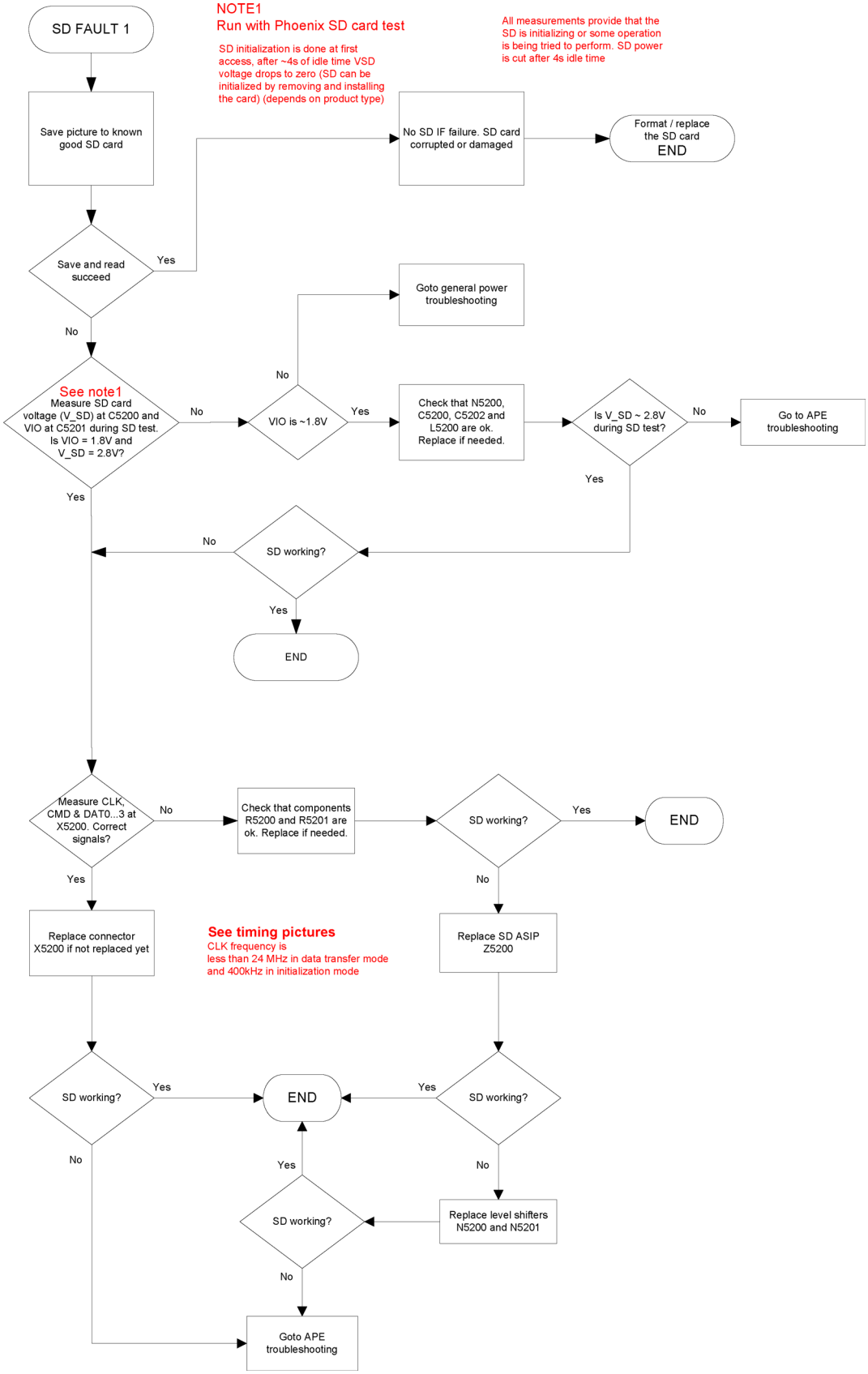
SD card troubleshooting

Troubleshooting flow



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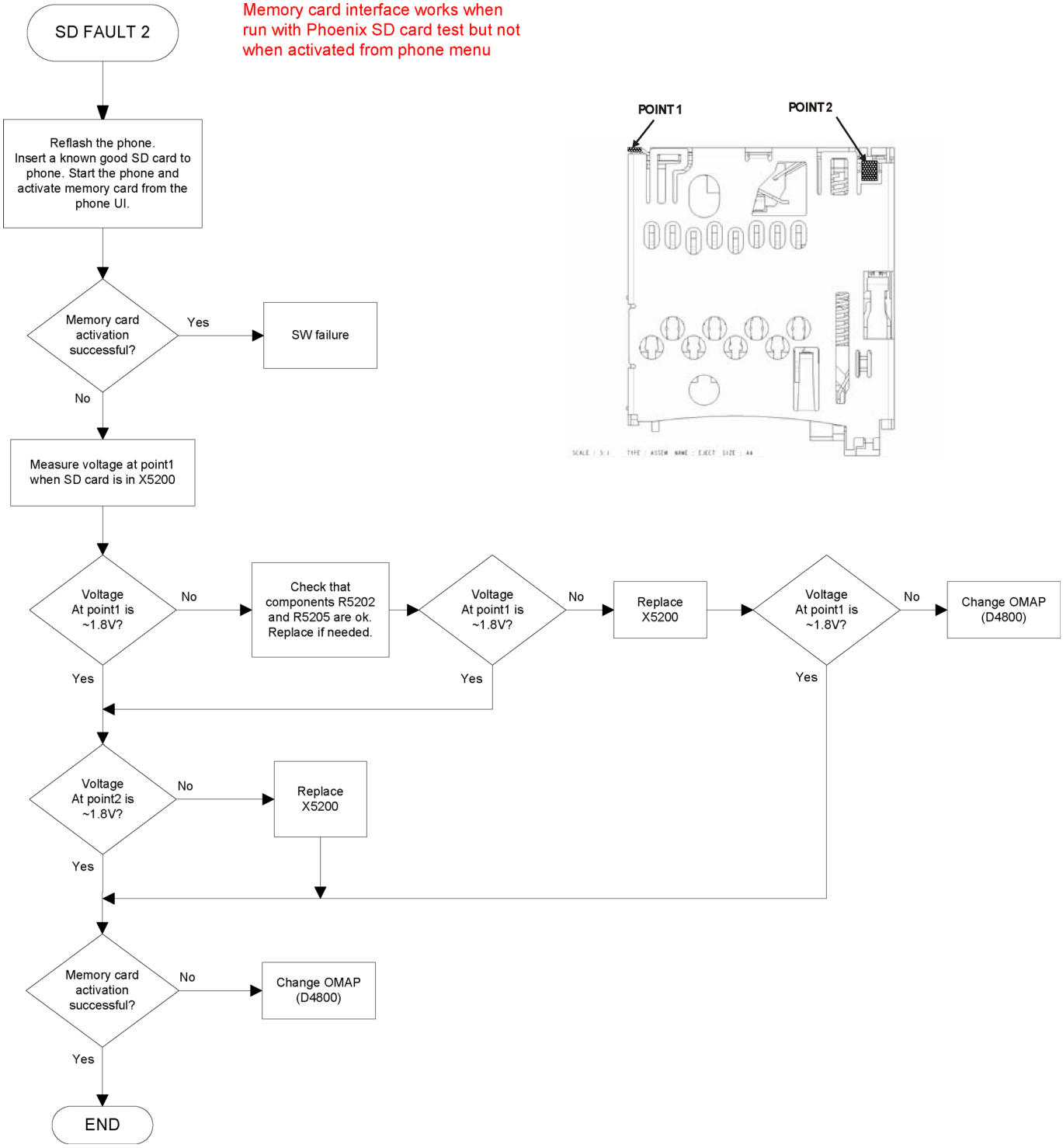

Display module troubleshooting

General instructions for display troubleshooting

The first step is to verify with a working display that the fault is not on the display module itself. The display module cannot be repaired.

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The second step is to check that the cellular engine is working normally. This can be done by connecting the phone to a docking station and starting Phoenix service software. With the help of Phoenix read the phone information to check that also the application engine is functioning normally (you should be able to read the APE ID).

After these checks proceed to the display troubleshooting flowcharts. Use the Display Test tool in Phoenix to find the detailed fault mode.

Operating modes of the display

The display is in a normal mode when the phone is in active use.

The display is in a partial idle mode when the phone is in the screen saver mode.

The operating modes of the display can be controlled with the help of Phoenix.

Table 9 Display module troubleshooting cases

Display blank	There is no image on the display. The display looks the same when the phone is on as it does when the phone is off. The backlight can be on in some cases.
Image on the display not correct	Image on the display can be corrupted or a part of the image can be missing. If a part of the image is missing, change the display module. If the image is otherwise corrupted, follow the appropriate troubleshooting diagram.
Backlight dim or not working at all	Backlight LED components are inside the display module. Backlight failure can also be in the connector or in the backlight power source in the main engine of the phone. Backlight is also controlled automatically by the ambient light sensor. This means that in case the display is working (image OK), the backlight is faulty.
Visual defects (pixel)	Pixel defects can be checked by controlling the display with Phoenix. Use both colours, black and white, on a full screen. The display may have some random pixel defects that are acceptable for this type of display. The criteria when pixel defects are regarded as a display failure, resulting in a replacement of the display, are presented the following table.

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Table 10 Pixel defects

<table>
<tr><th colspan="2">Item</th><th colspan="4">Bright dot defect</th><th colspan="4">Dim dot defect</th></tr>
<tr><td rowspan="11">1</td><td rowspan="11">Defect counts</td><td>R</td><td>G</td><td>B</td><td>Total</td><td>R</td><td>G</td><td>B</td><td>Total</td></tr>
<tr><td>R_0</td><td>G_0</td><td>B_0</td><td rowspan="3">-</td><td rowspan="3"></td><td>G_0</td><td rowspan="3"></td><td rowspan="3">0</td></tr>
<tr><td colspan="3">Acceptable</td><td>0</td></tr>
<tr><td>R_{BL2}</td><td>G_{BL2}</td><td>B_{BL2}</td><td>G_{DL2}</td></tr>
<tr><td colspan="4" rowspan="3"></td><td>R_0</td><td>G_{DM1}</td><td>B_0</td><td rowspan="3">2</td></tr>
<tr><td>2</td><td>2</td><td>2</td></tr>
<tr><td>R_{DM2}</td><td>G_{DM2}</td><td>B_{DM2}</td></tr>
<tr><td>R_{BH1}</td><td>G_{BH1}</td><td>B_{BH1}</td><td rowspan="3">0</td><td>R_{DH1}</td><td>G_{DH1}</td><td>B_{DH1}</td><td rowspan="3">-</td></tr>
<tr><td>0</td><td>0</td><td>0</td><td colspan="3">Acceptable</td></tr>
<tr><td>R_{63}</td><td>G_{63}</td><td>B_{63}</td><td>R_{63}</td><td>G_{63}</td><td>B_{63}</td></tr>
<tr><td>2</td><td>Combined defect counts</td><td colspan="8">No combine dot defect allowed.
*Two Single dim dot defects that are within 5mm of each other should be counted as a combined dot defect.</td></tr>
</table>

Note: Blinking pixels are not allowed in normal operating temperatures and light conditions.

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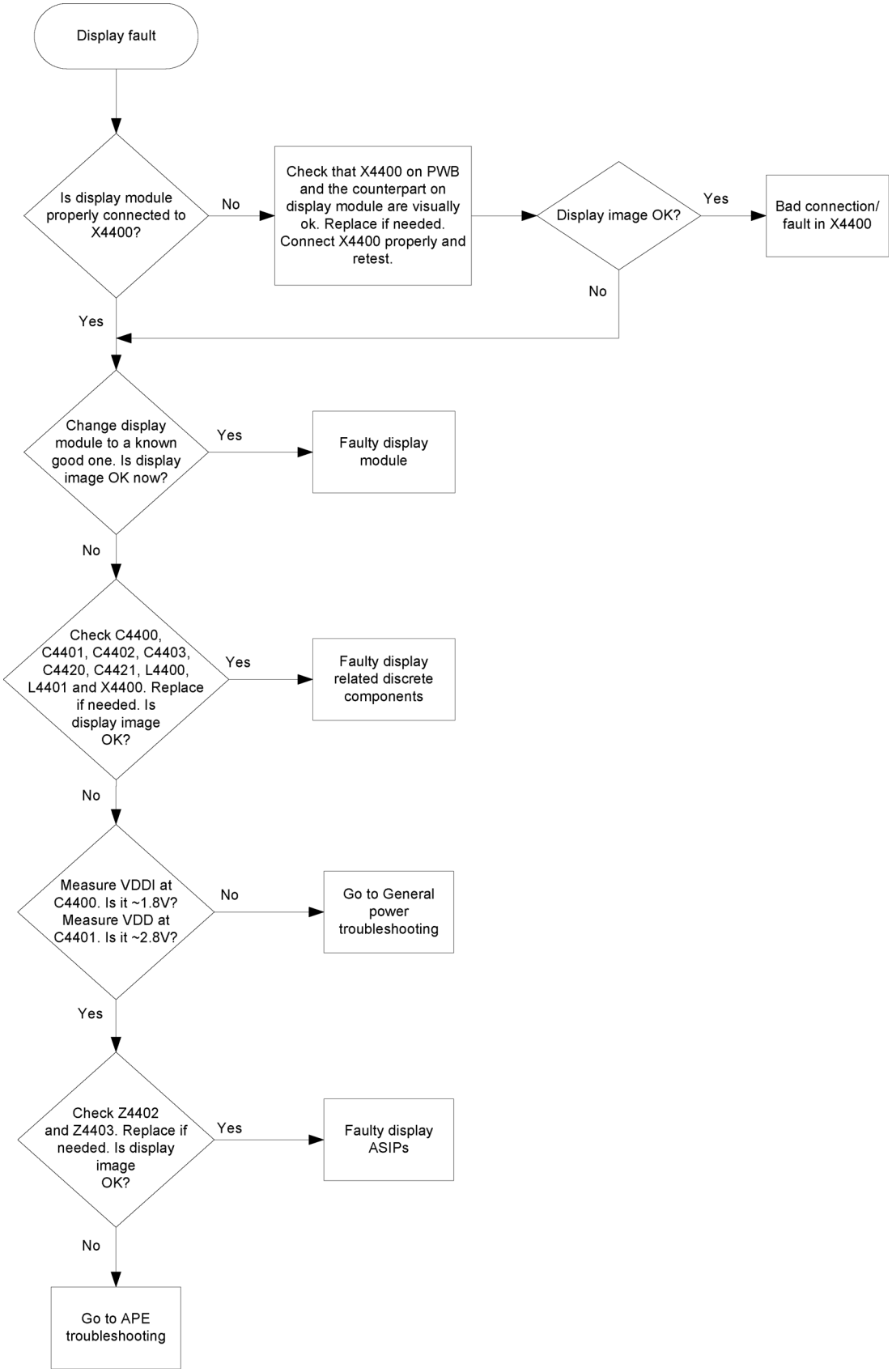
Display fault troubleshooting

Troubleshooting flow



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Display and keyboard backlight troubleshooting

Context

The device has one LED driver that provides current for the display backlight.

The brightness of the display is adjusted by the Ambient Light Sensor (ALS).

You can enable/disable ALS with the help of Phoenix service software.

Display brightness can be adjusted manually, if ALS is disabled. If the ambient light sensor is enabled, it adjusts the display brightness automatically.

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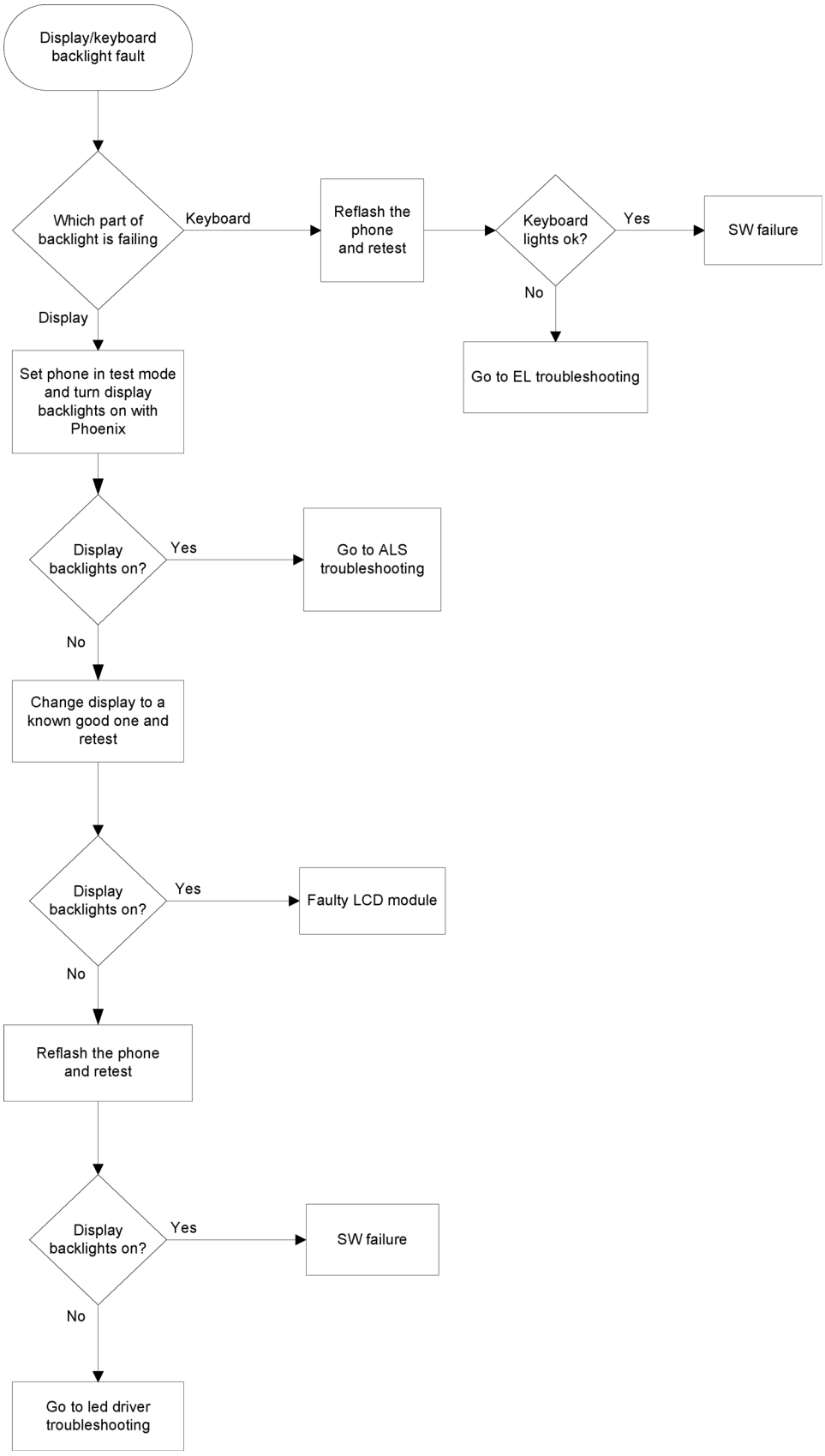
Troubleshooting flow



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Related information

- Display fault troubleshooting (page 6–37)
- LED driver troubleshooting (page 6–42)
- ALS troubleshooting (page 6–40)

ALS troubleshooting

Context

- If a phototransistor is broken, replace it with a typical phototransistor.
- After replacing the phototransistor or if calibration values are lost for some other reason, ALS re-tuning is required.
- Before starting the ALS calibration procedure, perform the 'Pull-up resistor calibration' in dark lighting conditions, and write the measured 'correction' value to the phone. After this ALS calibration procedure is performed, and the default co-efficient value '1' is written to the phone.
- Make sure that you have completed **Display and keypad backlight troubleshooting** first before starting **ALS troubleshooting**.

Here are some hints for ALS troubleshooting; the following troubleshooting diagram refers to these:

- *Phoenix* LED control tool also shows you luminance. The correct luminance in darkness is <20 lx, and in office environment 100-2000 lx. The luminance value depends strongly on the light source and the angle of the phone, so these values are only a rough guideline.
- LED driver control voltage measurement points can be found from the **LED driver troubleshooting** section. When backlight brightness is set to 100%, enable PWM is 100%.
- *Phoenix* has an ambient light sensor calibration tool for changing calibration values. The pull-up resistor calibration is done first. See the following procedure.

Steps

1. Cover the light guide (upper part of the A-Cover).
2. Start *Phoenix*.
3. Choose **File→Scan Product.**

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4. Choose **Tuning→Ambient Light Sensor Calibration.**

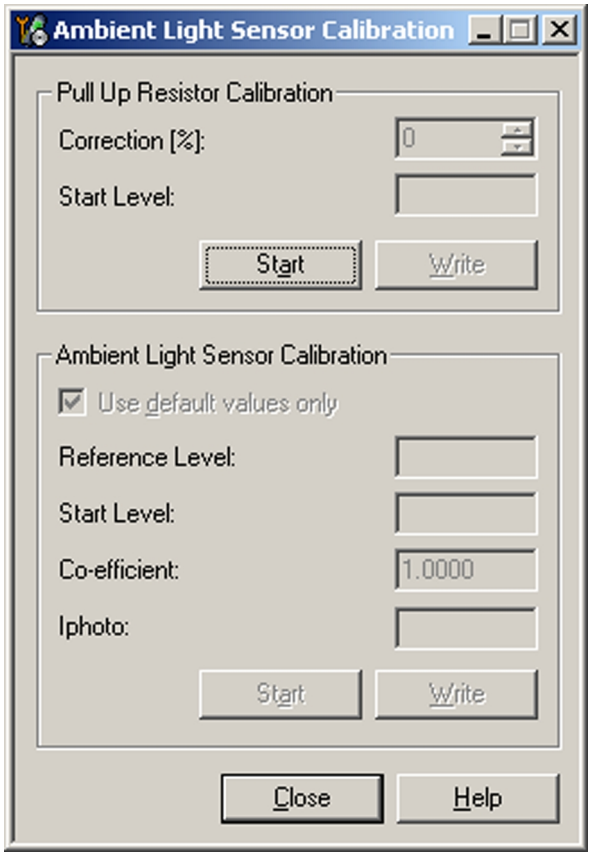

Figure 44 *Ambient Light Sensor Calibration* window

5. In the *Pull Up Resistor Calibration* pane, click **Start**, and **Write**.
6. In the *Ambient Light Sensor Calibration* pane, check the **Use default values only** check box, and click **Write**.
7. To end the calibration, click **Close**.

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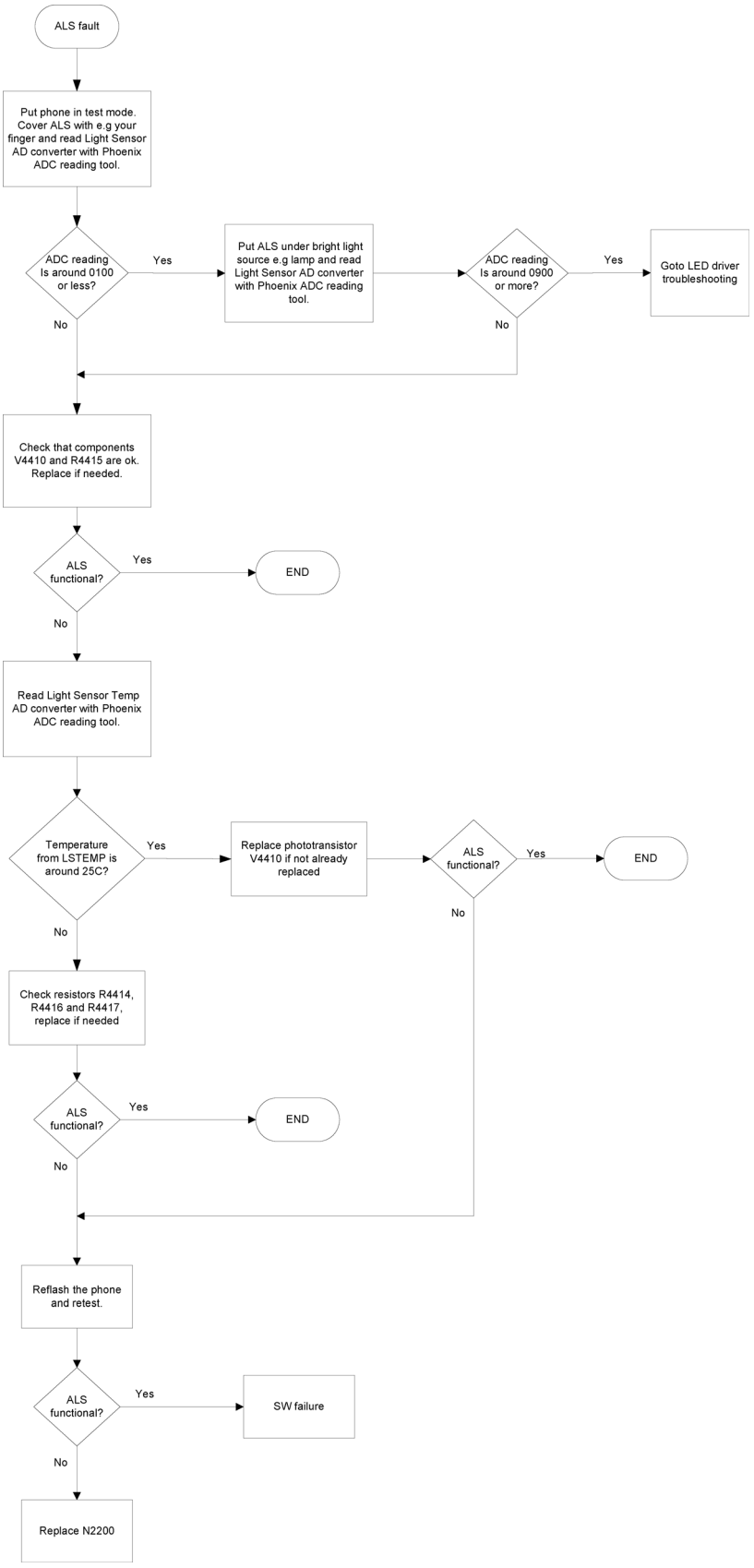
Troubleshooting flow



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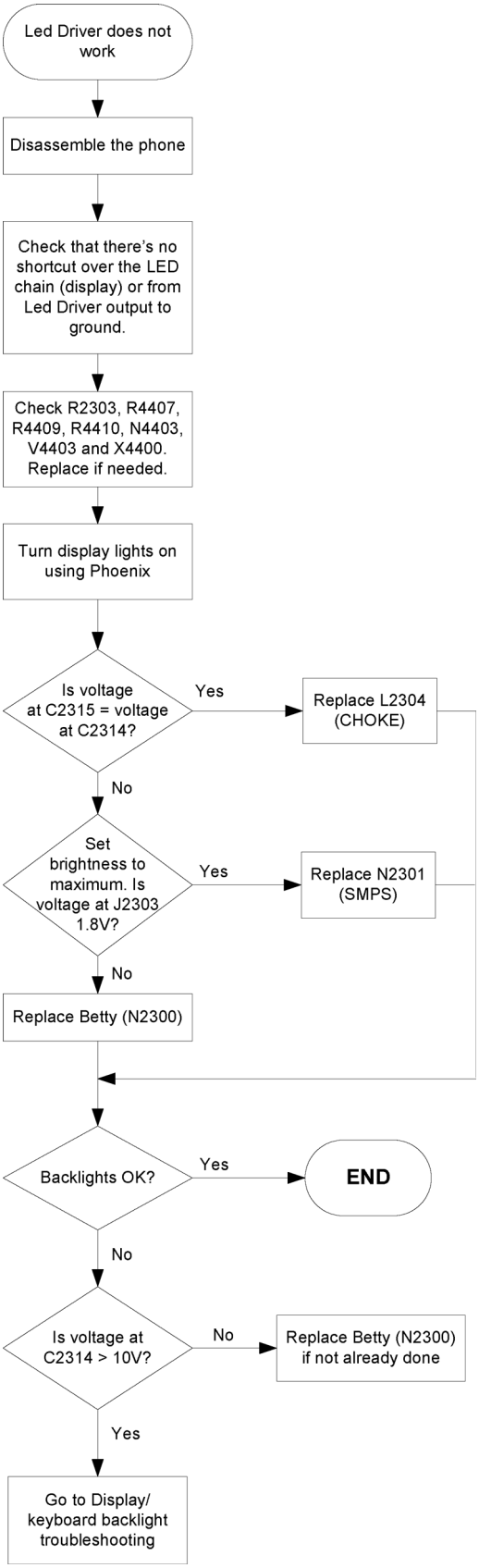
LED driver troubleshooting

Troubleshooting flow



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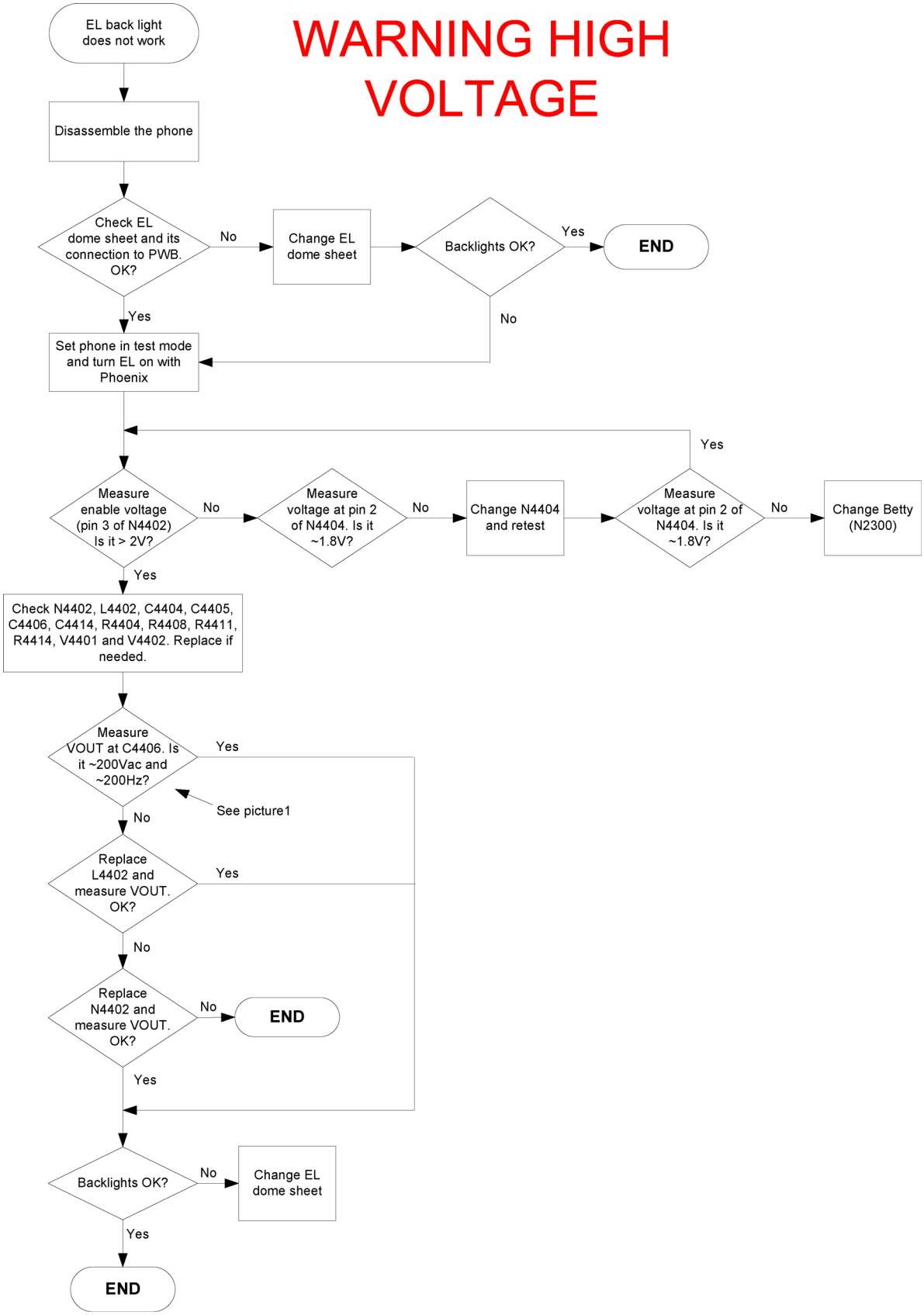
EL backlight fault troubleshooting

Troubleshooting flow



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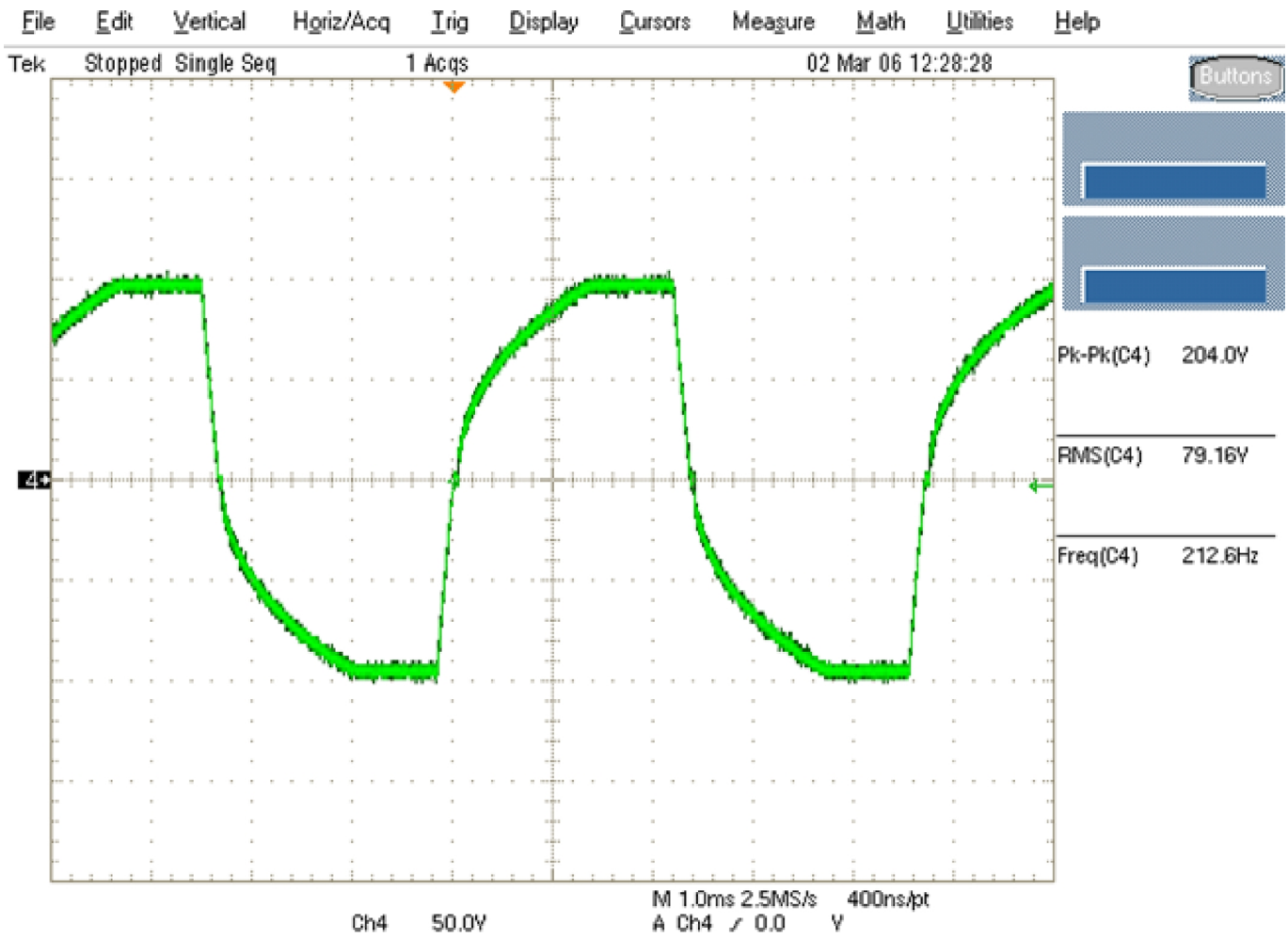

Bluetooth troubleshooting

Introduction to Bluetooth troubleshooting

There are two main Bluetooth problems that can occur:

Problem	Description
Detachment of the BT antenna.	This would most likely happen if the device has been dropped repeatedly to the ground. It could cause the BT antenna to become loose or partially detached from the PWB. (see next page for details about BT antenna HW and Mechanics)
A malfunction in the BT ASIC, BB ASICs or Phone's BT SMD components.	This is unpredictable and could have many causes i.e. SW or HW related.

The main issue is to find out if the problem is related to the BT antenna or related to the BT system or the phone's BB and then replace/fix the faulty component.

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Location of the bluetooth/WLAN antenna

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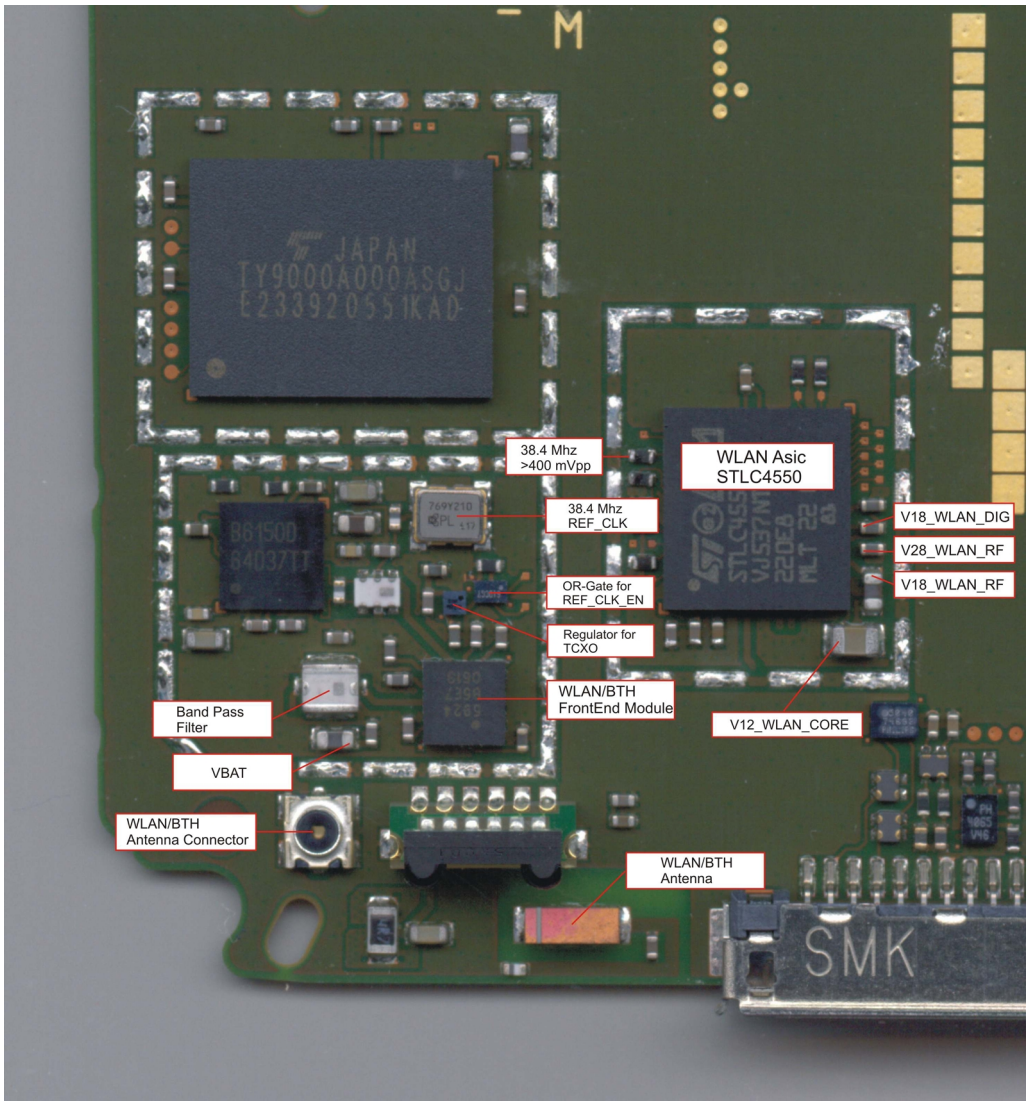
Bluetooth component layout



Bluetooth self tests in Phoenix

Steps

1. Start *Phoenix* service software.
2. From the **File** menu, choose **Open Product**, and then choose the correct type designator from the **Product** list.
3. Connect the phone to a docking station in the local mode.
4. Choose **Testing→Self Tests** .
5. Choose the following Bluetooth related tests:
   - ST_LPRF_IF_TEST
   - ST_LPRF_AUDIO_LINES_TEST
   - ST_BT_WAKEUP_TEST
   - ST_BT _WLAN_COEXISTENCE_TEST

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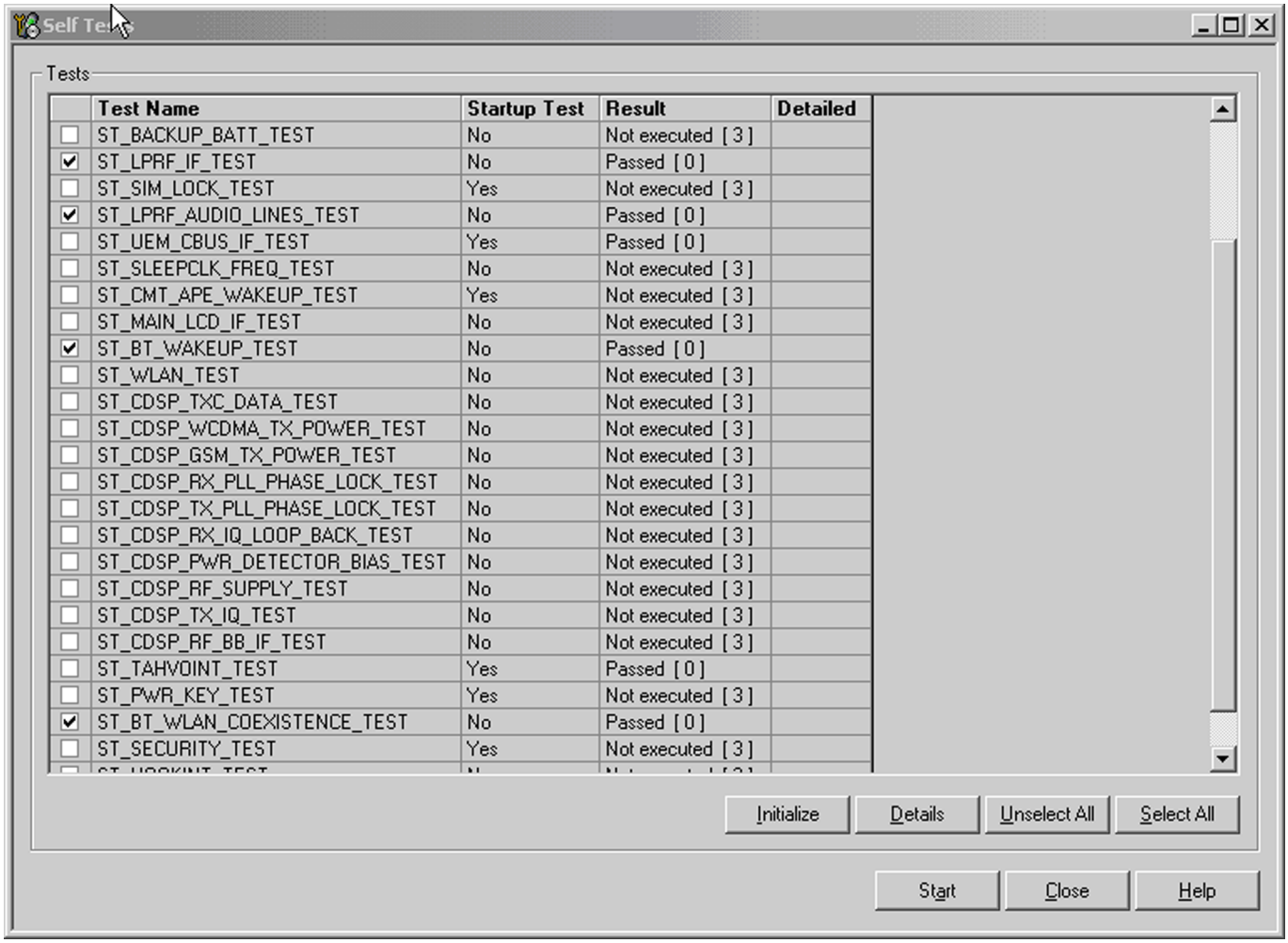

Figure 45 Bluetooth self tests in *Phoenix*

6. To run the test, click **Start**. When the results are **Passed (0)**, the BT Self Test is accepted.

Bluetooth BER tests in Phoenix

Steps

1. Start *Phoenix* service software.
2. From the **File** menu, choose **Open Product**, and then choose the correct type designator from the **Product** list.
3. Connect the phone to a docking station in the local mode.
4. Choose **Testing→Bluetooth LOCALS** .
5. Locate SB-6's serial number (12 digits) found in the type label on the back of BT-box.
6. In the *Bluetooth LOCALS* window, write the 12-digit serial number on the "Counterpart BT Device Address" line.

   This needs to be done only once provided that SB-6 is not changed.

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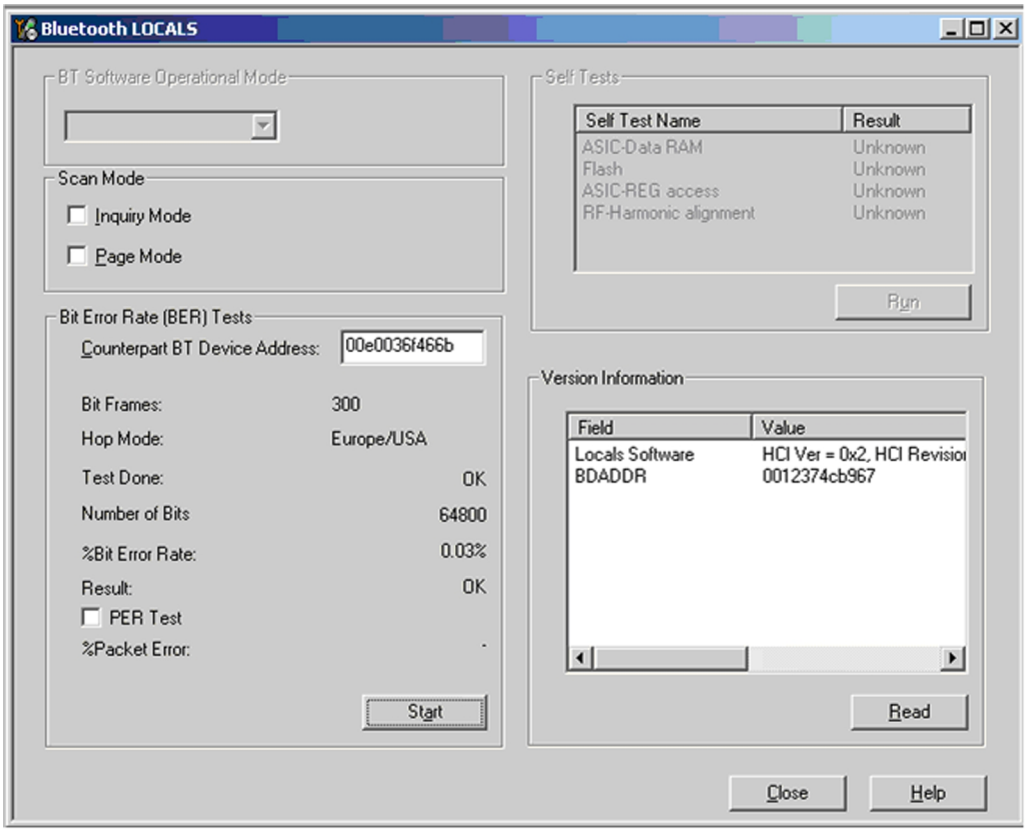

Figure 46 Bluetooth BER test in Phoenix

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7. Place the BT box near (within 10 – 15 cm) to the BT antenna.

8. To run the tests, click **Run BER Test**.

Results

When the BER Test Result is **below 0.1%** (depending on distance), the test is passed.

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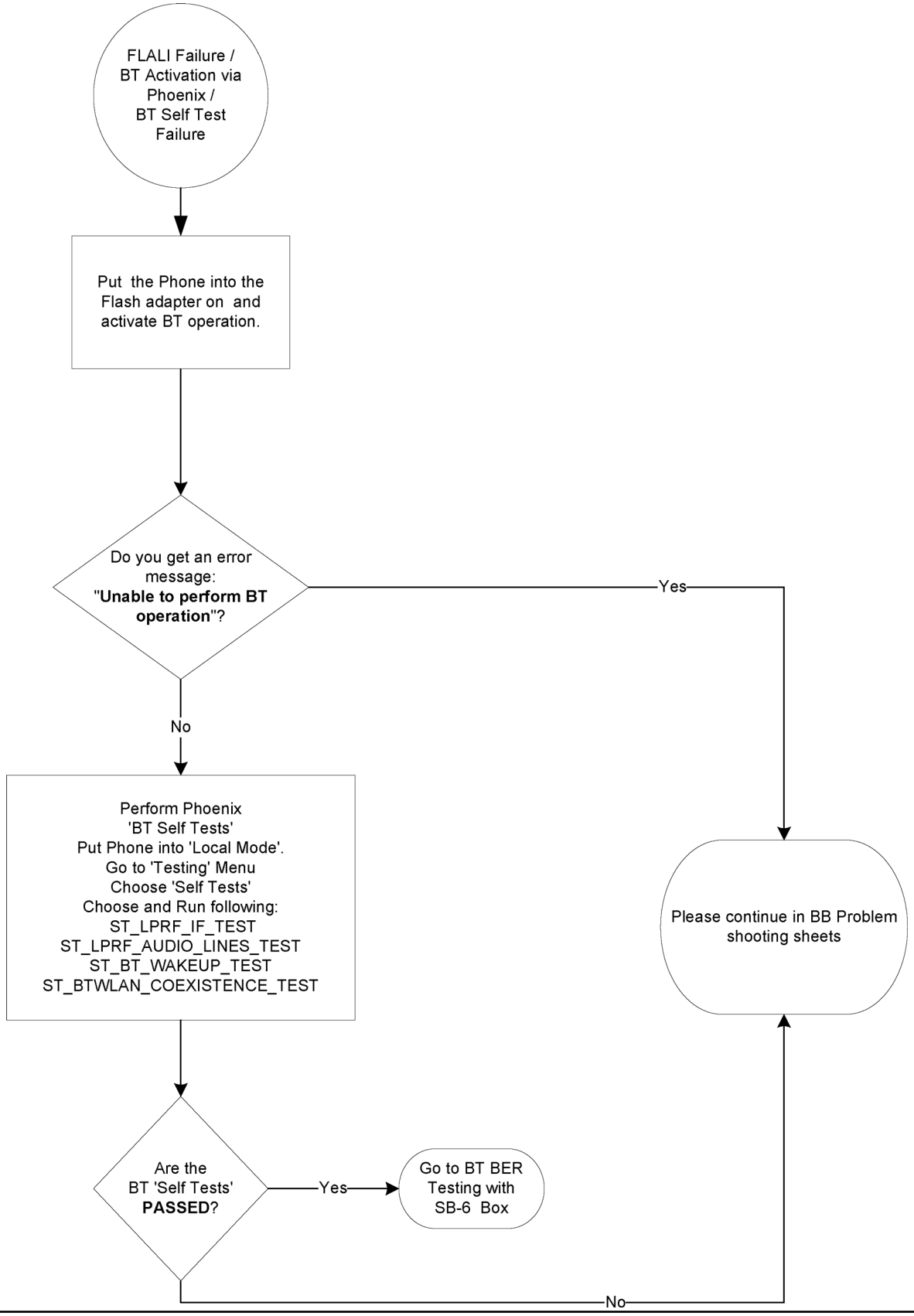
FLALI/BT failure troubleshooting

Troubleshooting flow



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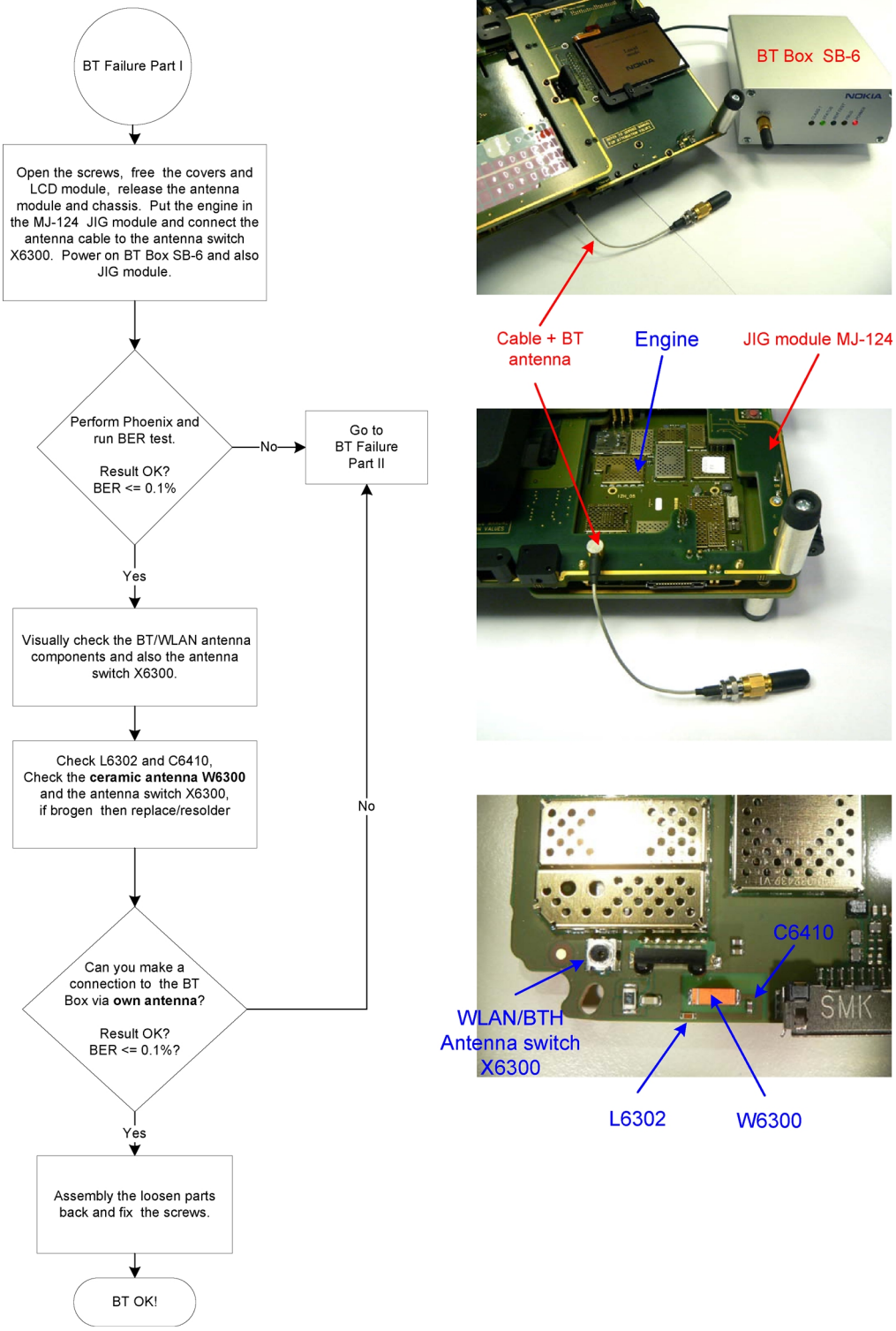
Bluetooth BER failure troubleshooting

Troubleshooting flow

Part I: Check that the BT/WLAN antenna is working correctly.



Part II: Check that BTH components and voltage levels are OK.

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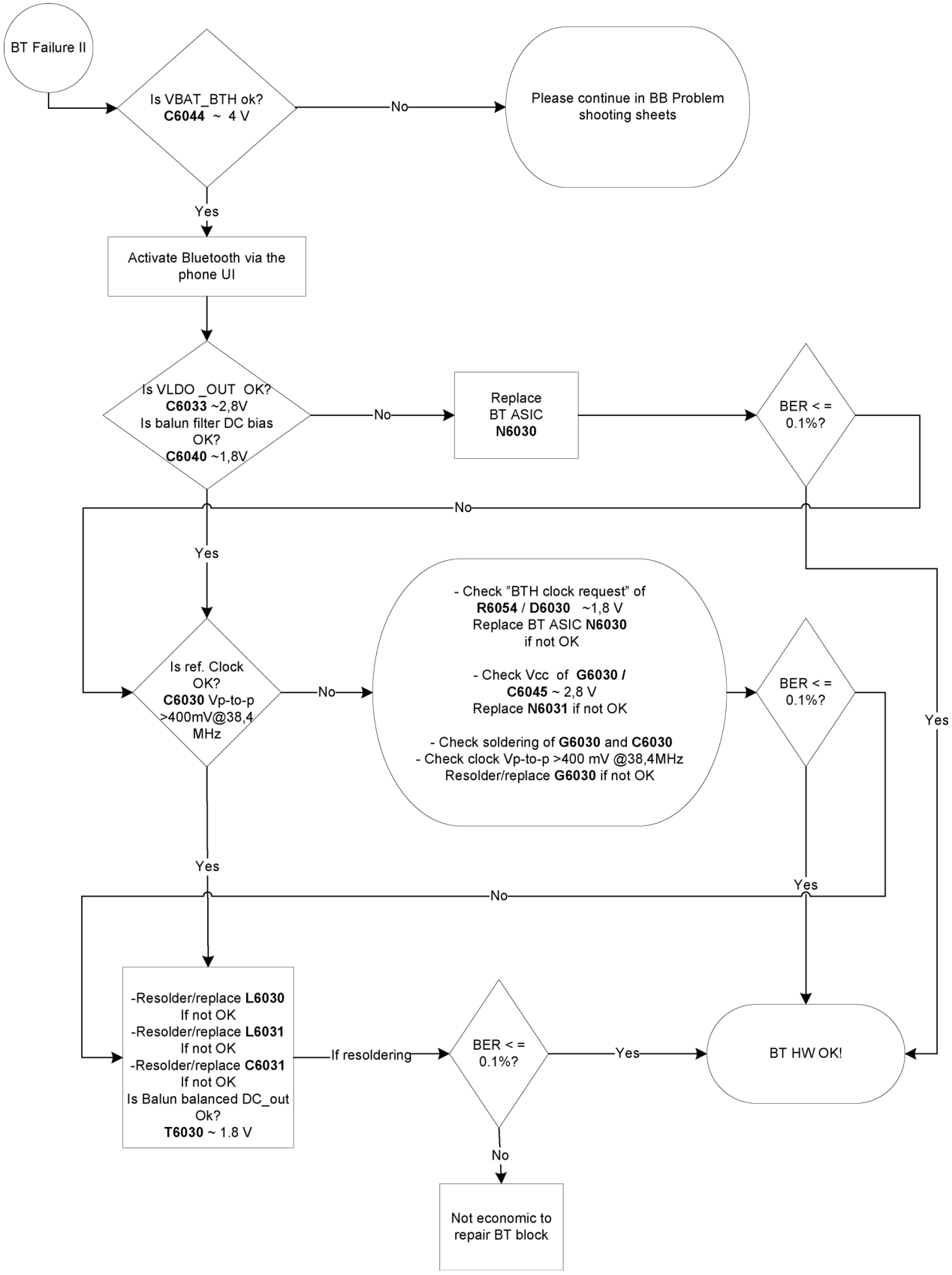

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Audio troubleshooting

Audio troubleshooting test instructions

Differential external earpiece and internal earpiece outputs can be measured either with a single-ended or a differential probe.

When measuring with a single-ended probe each output is measured against the ground.

Internal handsfree output is measured using a current probe, if a special low-pass filter designed for measuring a digital amplifier is not available. Note also that when using a current probe, the input signal frequency must be set to 2kHz.

The input signal for each loop test can be either single-ended or differential.

Required equipment

The following equipment is needed for the tests:

- Oscilloscope
- Function generator (sine waveform)
- 'Active speaker' or 'speaker and power amplifier'
- Sound level meter
- Current probe (Internal handsfree DPMA output measurement)
- Phoenix service software
- Battery voltage 3.7V

Test procedure

Audio can be tested using the Phoenix audio routings option. Three different audio loop paths can be activated:

- External microphone to Internal earpiece
- External microphone to Internal handsfree speaker
- Internal microphone to External earpiece

Each audio loop sets routing from the specified input to the specified output enabling a quick in-out test. Loop path gains are fixed and they cannot be changed using Phoenix. Correct pins and signals for each test are presented in the following table.

Phoenix audio loop tests and test results

The results presented in the table apply when no accessory is connected and battery voltage is set to 3.7V.

Earpiece, internal microphone and speaker are in place during measurement. Applying a headset accessory during measurement causes a significant drop in measured quantities.

The gain values presented in the table apply for a differential output vs. single-ended/differential input.

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Loop test	Input terminal	Output terminal	Path gain [dB] (fixed)	Input voltage [mVp-p]	Differential output voltage [mVp-p]	Output DC level [V]	Output current [mA]
External Mic to External Earpiece	XMICP and GND	HSEAR R P, HSEAR R N and GND	-2.9	1000	720	1.2	NA
		HSEAR P, HSEAR N and GND					
	XMICN and GND	HSEAR R P, HSEAR R N and GND					
		HSEAR P, HSEAR N and GND					
External Mic to Internal Earpiece	XMICP and GND	EarP and GND	-4.5	1000	600	1.2	NA
		EarN and GND					
	XMICN and GND	EarP and GND					
		EarN and GND					
External Mic to Internal handsfree	XMICP and GND	X2100 pads	-5	1000	560	0	25mA (calc.)
	XMICN and GND	X2101 pads					
Internal Mic to External Earpiece	B2100 (OUT/GND)	HSEAR R P, HSEAR R N and GND	22.7	100	1360	1.2	NA
		HSEAR P, HSEAR N and GND					
		HSEAR R P, HSEAR R N and GND					
		HSEAR P, HSEAR N and GND					

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Measurement data

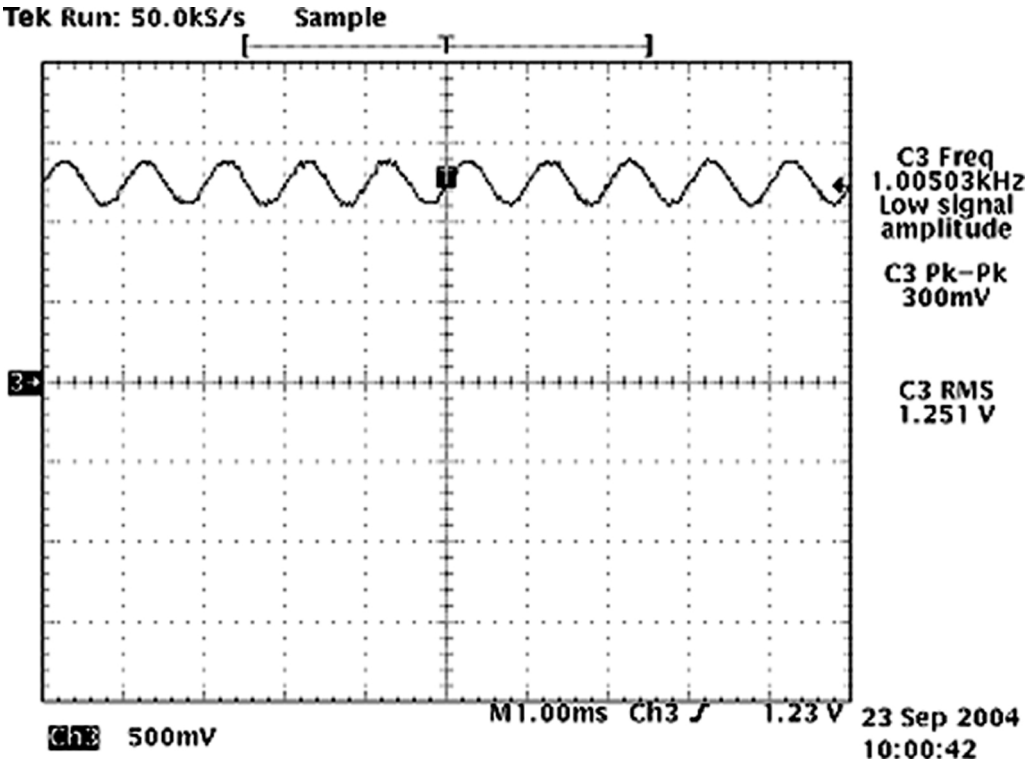
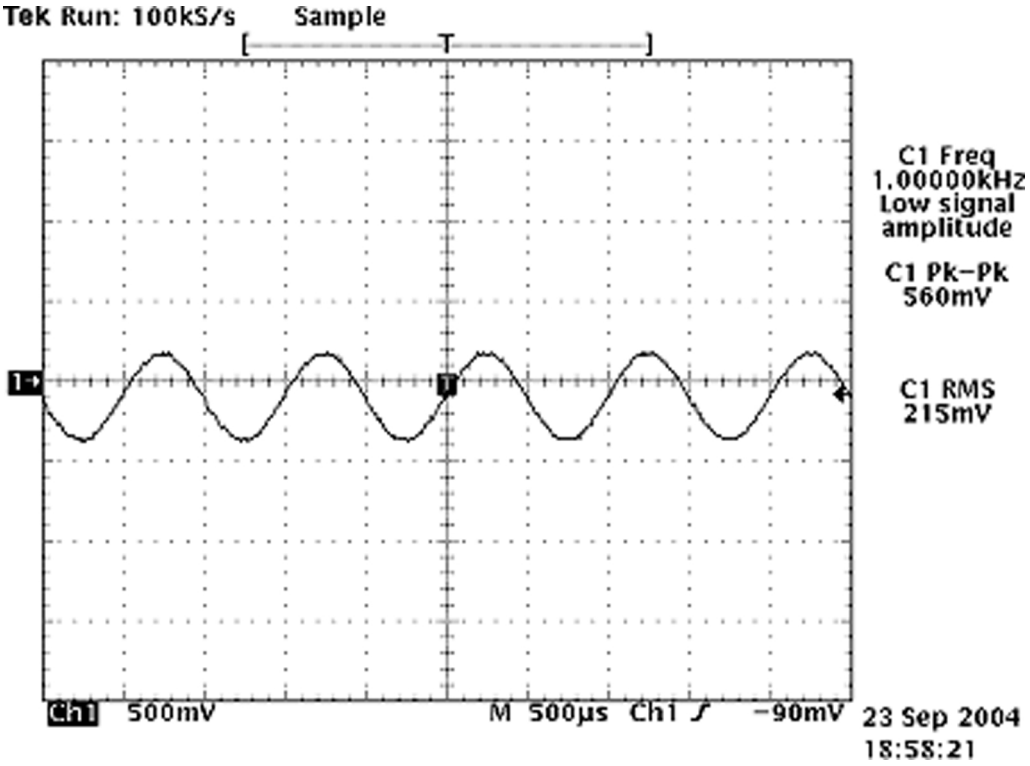


Figure 47 Single-ended output waveform of the Ext_in_HP_out measurement when earpiece is connected.



If a special low-pass filter designed for measuring digital amplifiers is unavailable, the measurement must be performed with a current probe and the input signal frequency must be 2kHz.

Figure 48 Differential output waveform of the Ext_in_IHF_out out loop measurement when speaker is connected.

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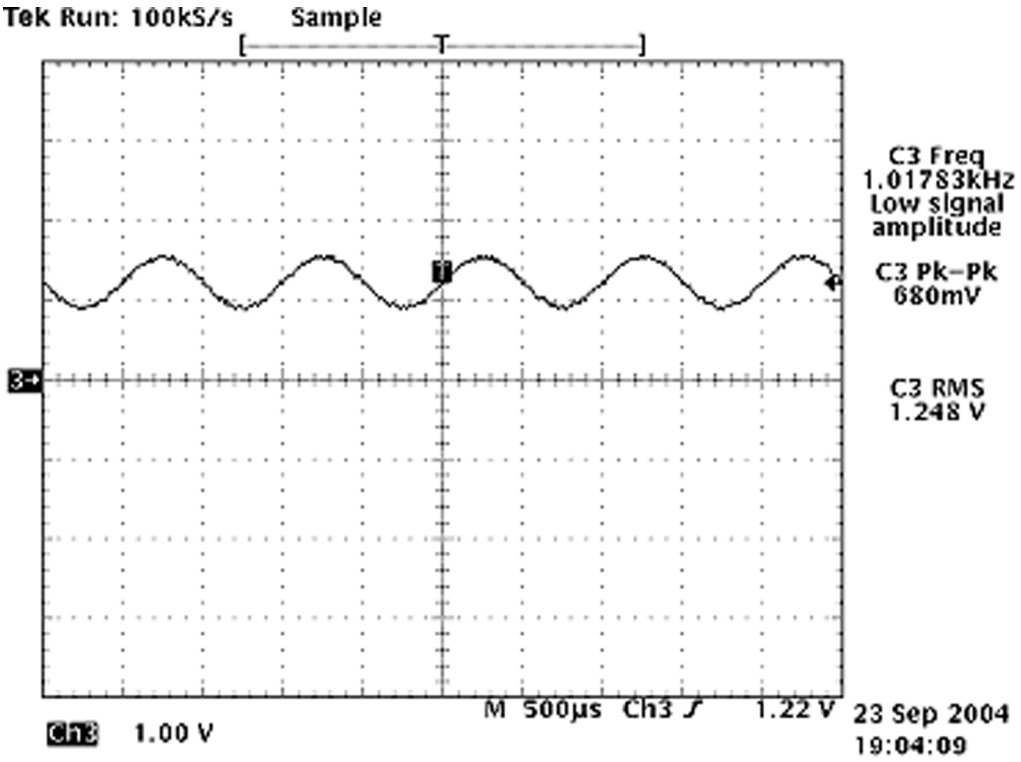

Figure 49 Single-ended output waveform of the HP_in_Ext_out loop when microphone is connected.

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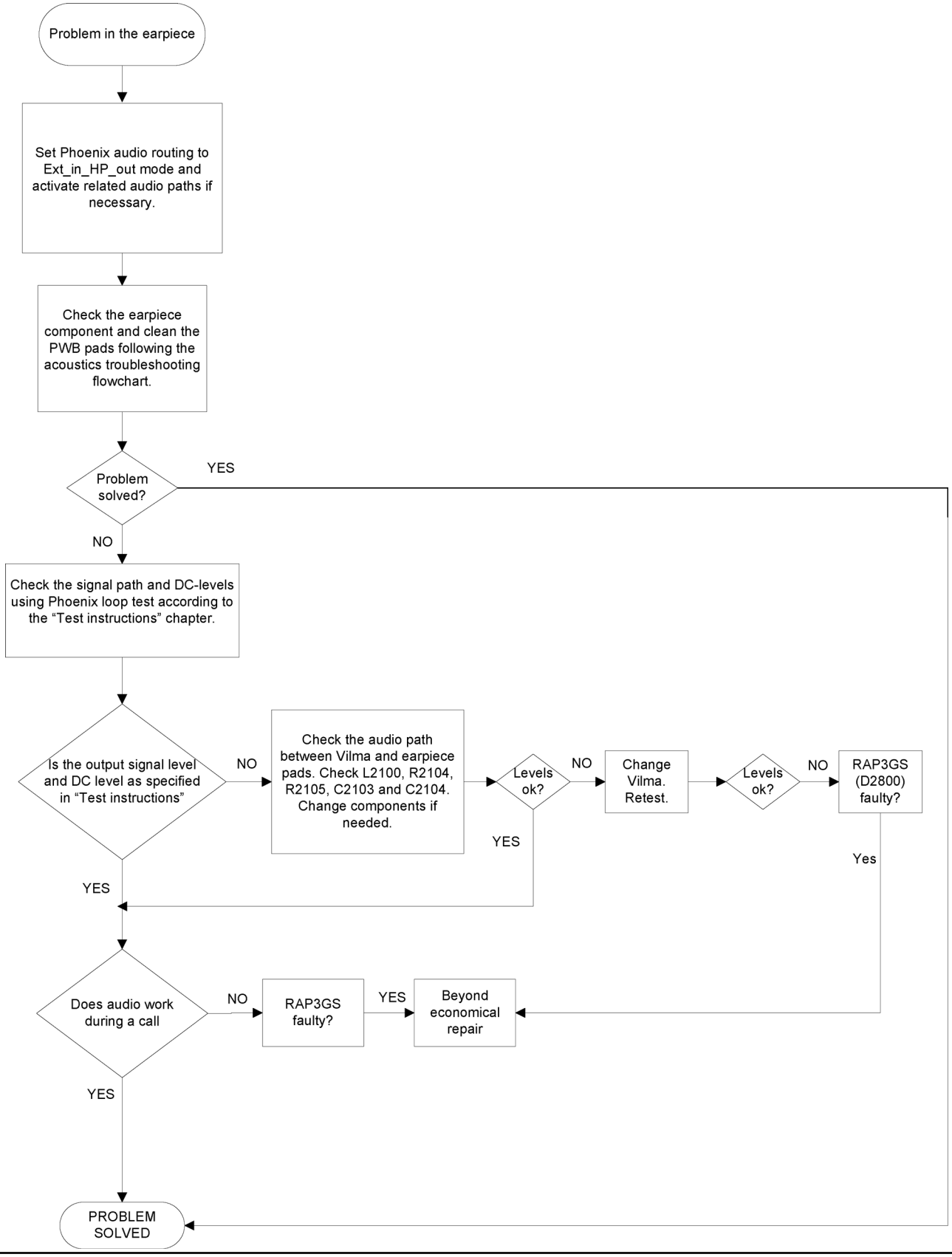
Internal earpiece troubleshooting

Troubleshooting flow



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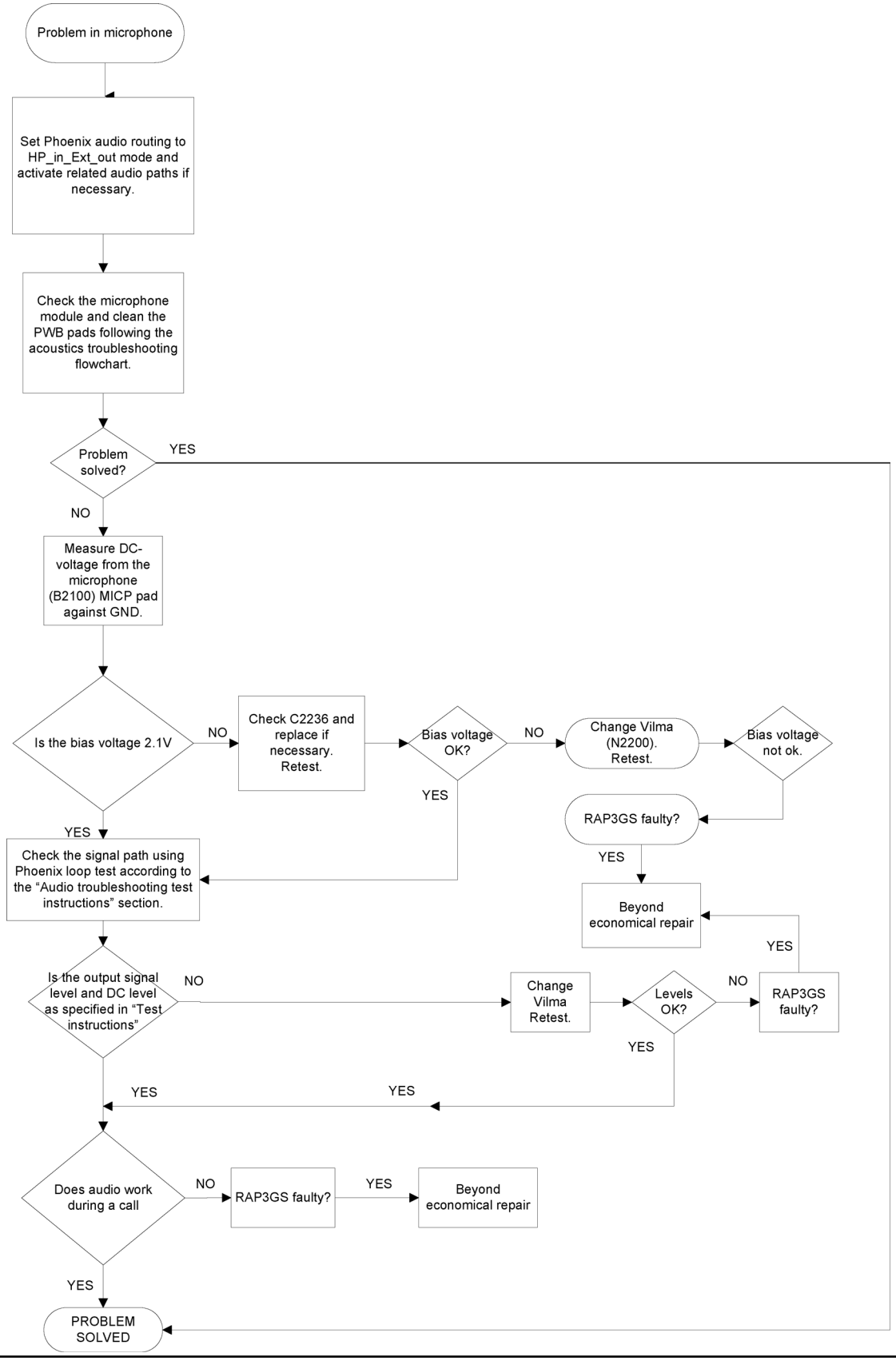
Internal microphone troubleshooting

Troubleshooting flow



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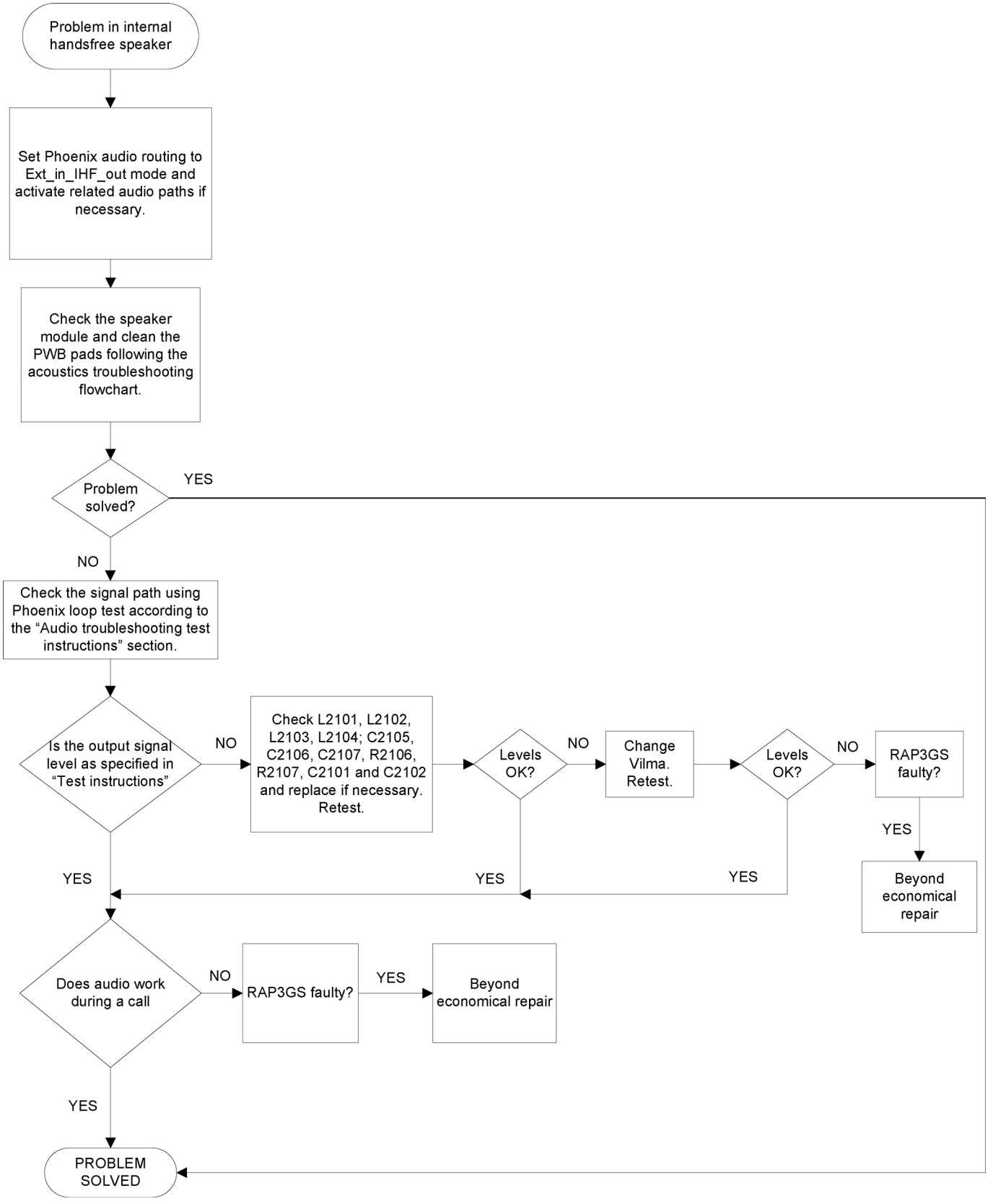
IHF troubleshooting

Troubleshooting flow



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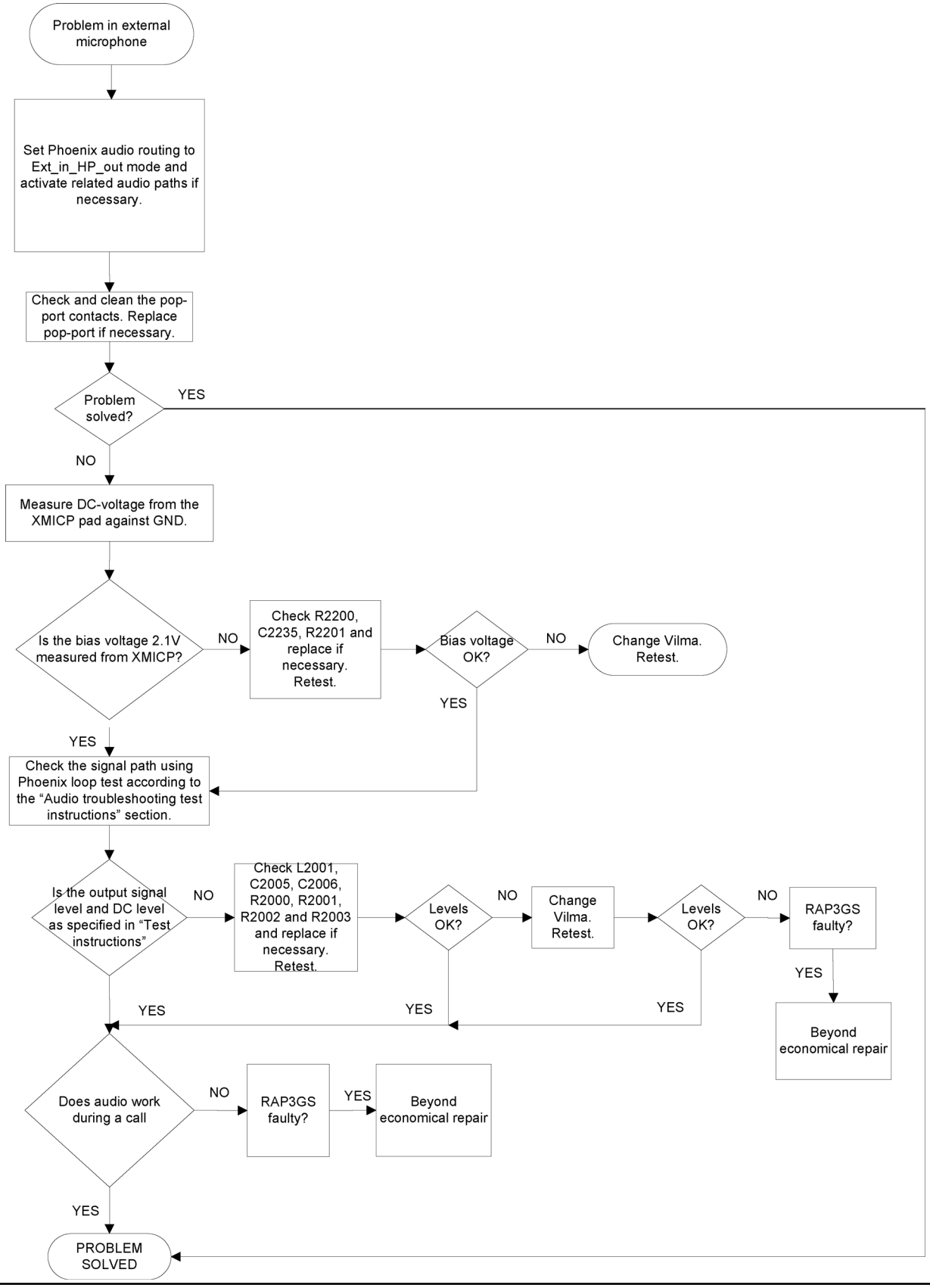
External microphone troubleshooting

Troubleshooting flow



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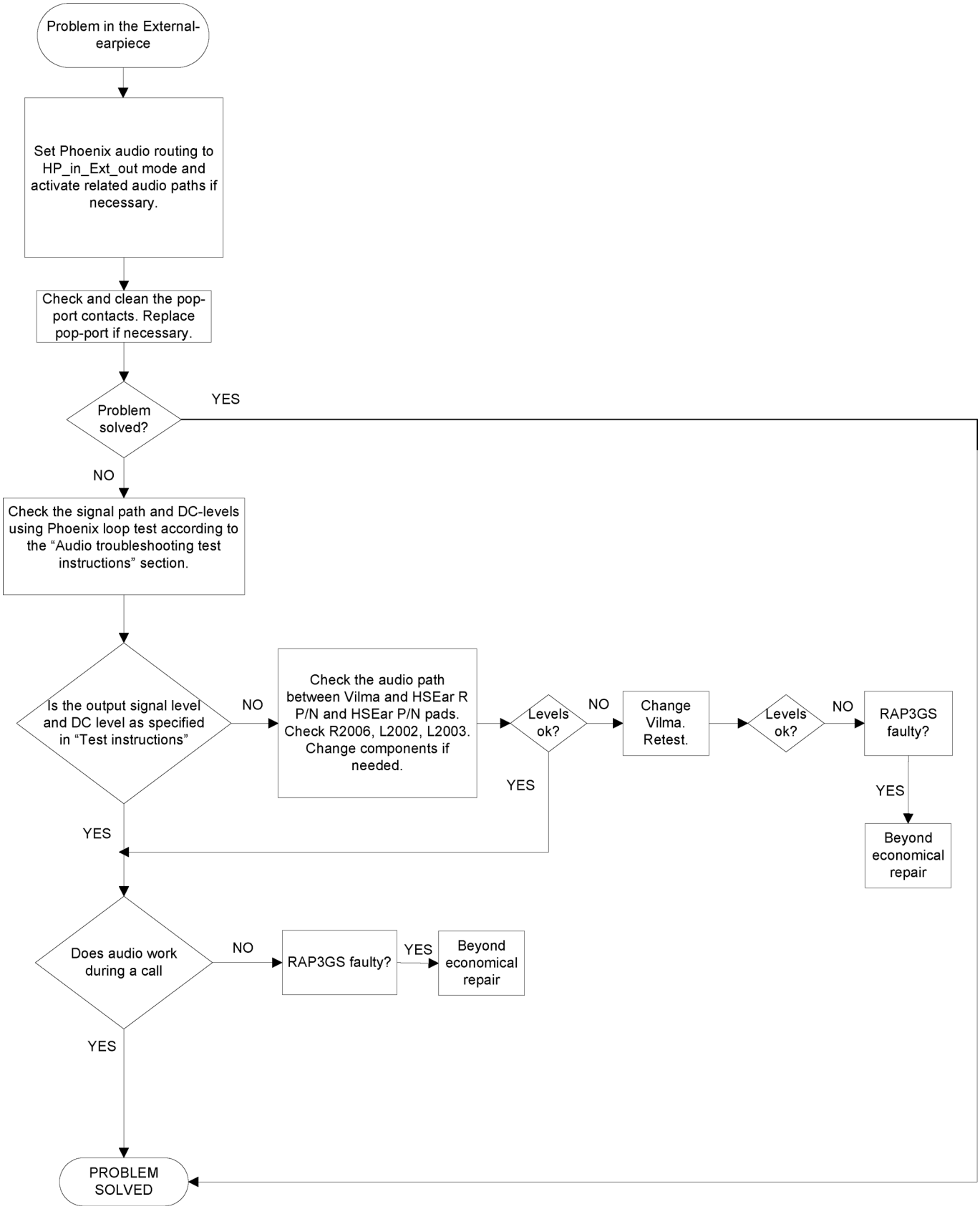
External earpiece troubleshooting

Troubleshooting flow



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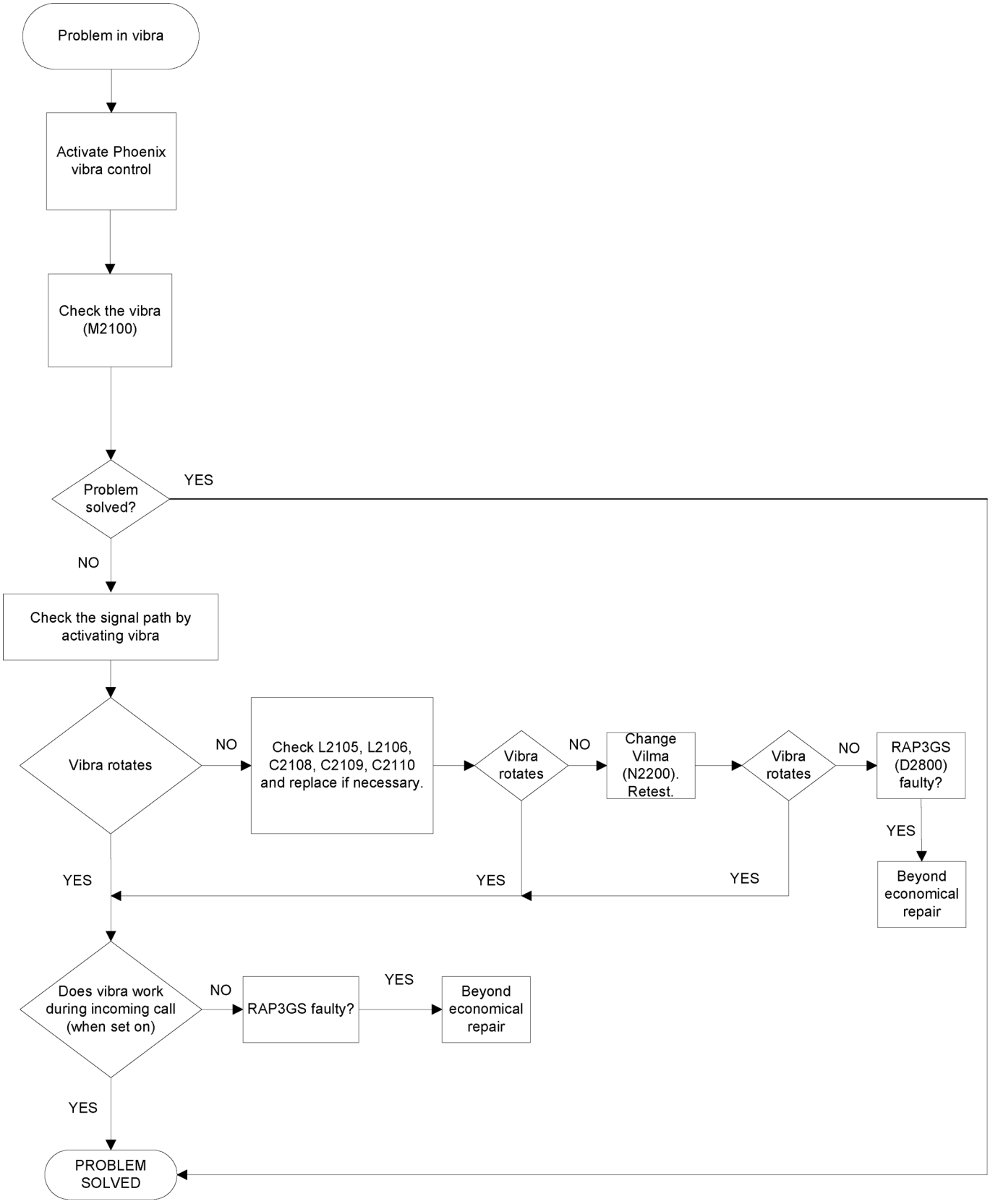
Vibra troubleshooting

Troubleshooting flow



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Baseband manual tuning guide

Energy management calibration

Prerequisites

Energy Management (EM) calibration is performed to calibrate the setting (gain and offset) of AD converters in several channels (that is, **battery voltage**, **BSI**, **battery current**) to get an accurate AD conversion result.

Hardware setup:

- An external power supply is needed.
- Supply 12V DC from an external power supply to CU-4 to power up the phone.
- The phone must be connected to a CU-4 control unit with a product-specific flash adapter.

Steps

1. Place the phone to the docking station adapter (CU-4 is connected to the adapter).
2. Start *Phoenix* service software.
3. Choose **File→ Scan Product.**
4. Choose **Tuning→Energy Management Calibration.**
5. To show the current values in the phone memory, click **Read**, and check that communication between the phone and CU-4 works.
6. Check that the **CU-4 used** check box is checked.
7. Select the item(s) to be calibrated.

   Note: ADC calibration has to be performed before other item(s). However, if all calibrations are selected at the same time, there is no need to perform the ADC calibration first.
8. Click **Calibrate**.

   The calibration of the selected item(s) is carried out automatically.

   The candidates for the new calibration values are shown in the *Calculated values* column. If the new calibration values seem to be acceptable (please refer to the following "Calibration value limits" table), click **Write** to store the new calibration values to the phone permanent memory.

Table 11 Calibration value limits

Parameter	Min.	Max.
ADC Offset	-20	20
ADC Gain	12000	14000
BSI Gain	1100	1300
VBAT Offset	2400	2650
VBAT Gain	19000	23000
VCHAR Gain	N/A	N/A
IBAT (ICal) Gain	7750	12250

9. Click **Read**, and confirm that the new calibration values are stored in the phone memory correctly. If the values are not stored to the phone memory, click **Write** and/or repeat the procedure again.
10. To end the procedure, close the *Energy Management Calibration* window.

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7 — RF Troubleshooting and Manual Tuning Guide

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Introduction to RF troubleshooting

Soldered metal shieldings and components below them are not allowed to be changed or removed. The purpose of the following troubleshooting document is only to identify possible RF faults and advice how to tune the phone if it is necessary.

All measurements should be done using:

- spectrum analyser with a high-frequency high-impedance passive probe (LO-/reference frequencies and RF power levels)
- oscilloscope with a 10:1 probe (DC-voltages and low frequency signals)

> **Caution:** A mobile phone WCDMA transmitter should never be tested with full Tx power, if there is no possibility to perform the measurements in a good performance RF-shielded room. Even low power WCDMA transmitters may disturb nearby WCDMA networks and cause problems to 3G cellular phone communication in wide area. WCDMA Tx measurements should be performed at least in an RF-shielded box and never with higher Tx power level than 0 dBm! Test full WCDMA Tx power only in RF-shielded environment.
>
> Also all measurements with an RF coupler should be performed in RF shielded environment because nearby base stations can disturb sensitive receiver measurements. If there is no possibility to use RF shielded environment, it should be checked that there are no transmissions on the same frequencies as used in the tests.

The RF section of the phone is build around one RF ASIC N7500. There are also GSM TXFEM (integrated PA and front end module) N7520 and WCDMA PA N7540 on board.

The WCDMA PA needs variable supply voltage to work properly, and therefore there is a switched mode power supply component added to the PWB (N7541).

Most RF semiconductors are static discharge sensitive. ESD protection must be taken care of during repair (ground straps and ESD soldering irons). The RF ASICs, both PAs and SMPS are moisture sensitive, so parts must be pre-baked prior to soldering.

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Troubleshooting test point locations

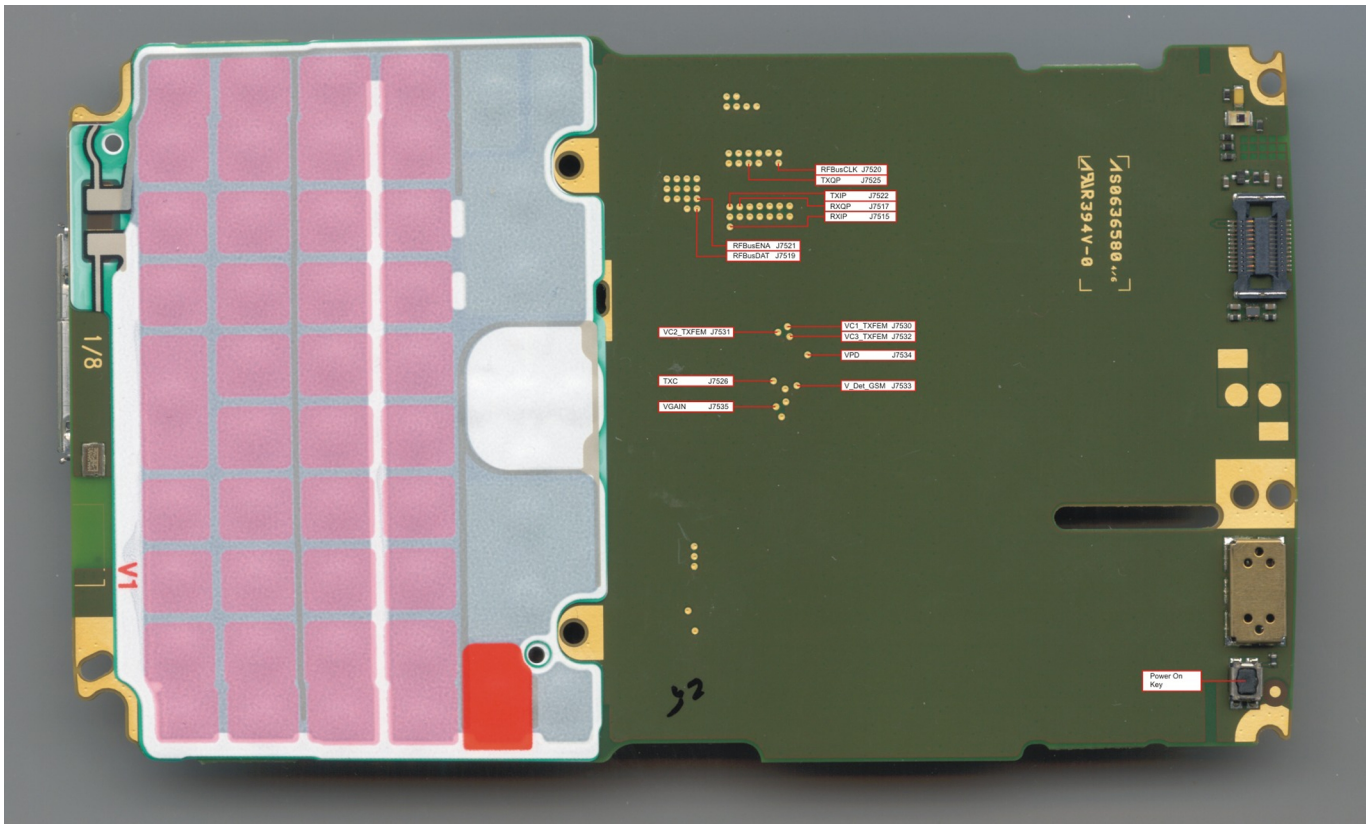

Figure 50 Test point locations

Table 12 GSM TXFEM / Antenna load switch CONTROL

Vgain GMSK=0 EDGE=1	GSM850		GSM900		GSM1800		GSM1900	
	RX	TX	RX	TX	RX	TX	RX	TX
VC1_TXFEM	0	1	0	1	0	1	0	1
VC2_TXFEM	0	0	0	0	1	1	1	1
VC3_TXFEM	1	1	0	1	0	1	1	1
RFC4	1	1	0	0	0	0	1	1
RFC9	0	0	1	1	1	1	0	0

Control logic levels 0 = 0 V and 1 = 2.8 V measured with oscilloscope. Mode selections through **Testing -> GSM -> RF Controls**.

Receiver troubleshooting

Introduction to Rx troubleshooting

Rx can be tested by making a phone call or in local mode. For the local mode testing, use the Phoenix service software.

The primary Rx troubleshooting parameter is RSSI (Received Signal Strength Indicator). For GSM RSSI measurement, see GSM Rx chain activation for manual measurements / GSM RSSI measurement (page 7–7), and for the same measurement in WCDMA, see WCDMA RSSI measurement (page 7–8).

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In GSM, the input signal can be either a real GSM signal or a CW (Continuous Wave) signal, which is 67.771 kHz above the carrier frequency.

In WCDMA, the input signal can be either a real WCDMA signal or a CW signal, which is 1 MHz above the carrier frequency.

For service tool usage instructions, refer to the section **Service Tools and Service Concepts**.

Related information

- WCDMA Rx chain activation for manual measurement (page 7–8)

GSM Rx chain activation for manual measurements / GSM RSSI measurement

Context

RSSI signal measurement is the main Rx troubleshooting measurement. The test measures the strength of the received signal.

I and Q branches can be measured separately. In GSM, the input signal can be either real GSM signal or a CW (Continuous Wave) signal that is 67.771 kHz above the carrier frequency.

Steps

1. Start *Phoenix* service software.
2. Choose **Testing→GSM→RSSI Reading** .
3. Set the RF signal generator for channel frequency +67.771 kHz CW mode with –90 dBm signal.

   Alternatively set the cellular tester downlink channel to the appropriate channel. Make sure that the tester is set to continuous mode, not to burst mode.
4. In the *RSSI Reading* window, select the appropriate band and channel.

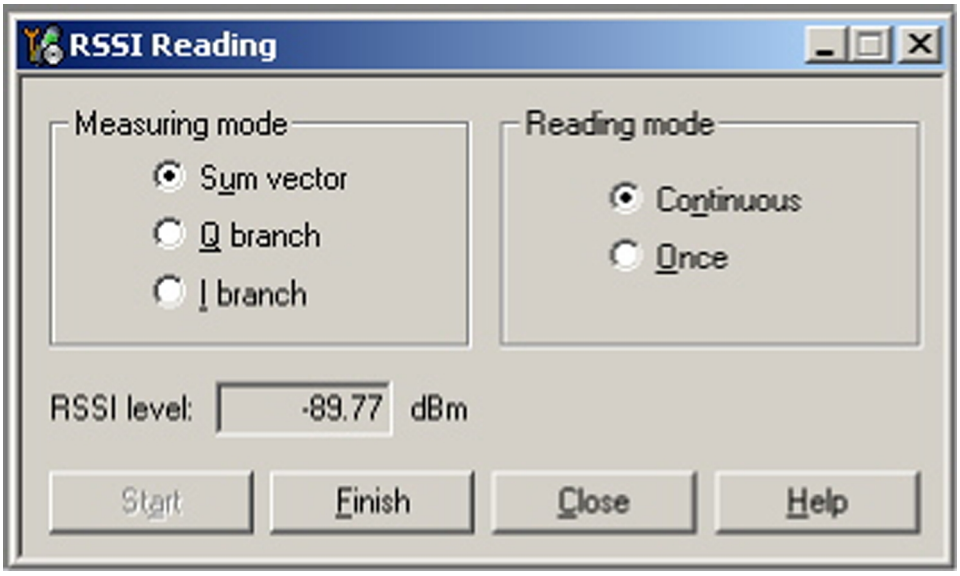

Figure 51 *RSSI Reading* window

5. To start the measurement, activate GSM Rx chain, click **Start**.

Results

RSSI reading values of the selected band and channel are displayed. The RSSI level must be the same value which is set at the signal generator (-90 dBm).

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WCDMA Rx chain activation for manual measurement

Steps

1. Start *Phoenix* service software.
2. Choose **Testing→WCDMA→Rx Control** .
3. In the *Rx Control* window:

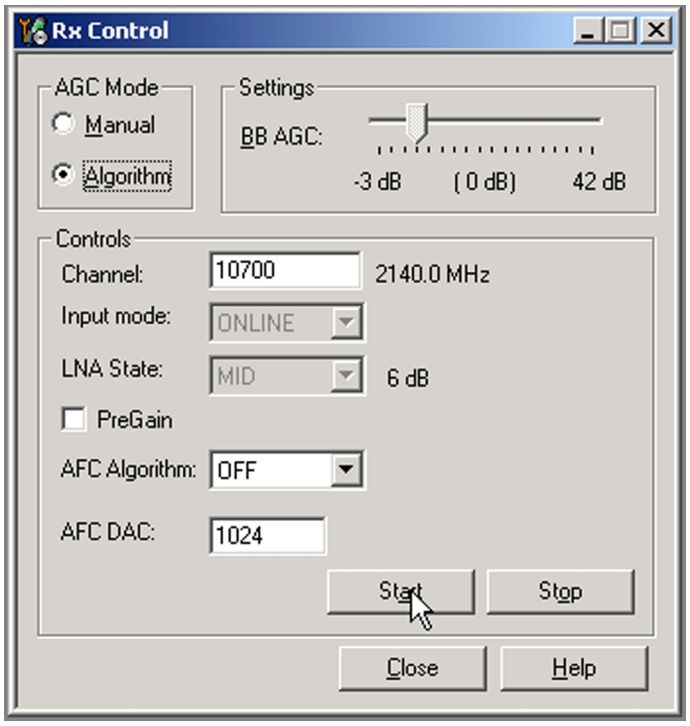

Figure 52 *Rx Control* window

- Set **AGC Mode** to **Algorithm**.
- Set **Channel** to **10700**.
- Set **AFC Algorithm** to **OFF** (Default = **OFF**).

Next actions

When settings are ready, click **Start** to activate them.

If settings are changed later on (for example, you give a new channel number), you will need to click **Stop** and **Start** again.

Note: Clicking **Stop** also disables **Tx Control** if that was active!

WCDMA RSSI measurement

Prerequisites

WCDMA Rx must be activated before RSSI can be measured. See WCDMA Rx chain activation for manual measurement (page 7–8).

Steps

1. Start *Phoenix* service software.
2. Choose **Testing→WCDMA→Rx Power Measurement** .

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3. Set RF signal: CW signal 1 MHz above the carrier frequency OR real WCDMA signal with -60 dBm level.
4. In the *Rx Power Measurement* window, choose the following settings:
   - Mode: RSSI
   - Continuous Mode

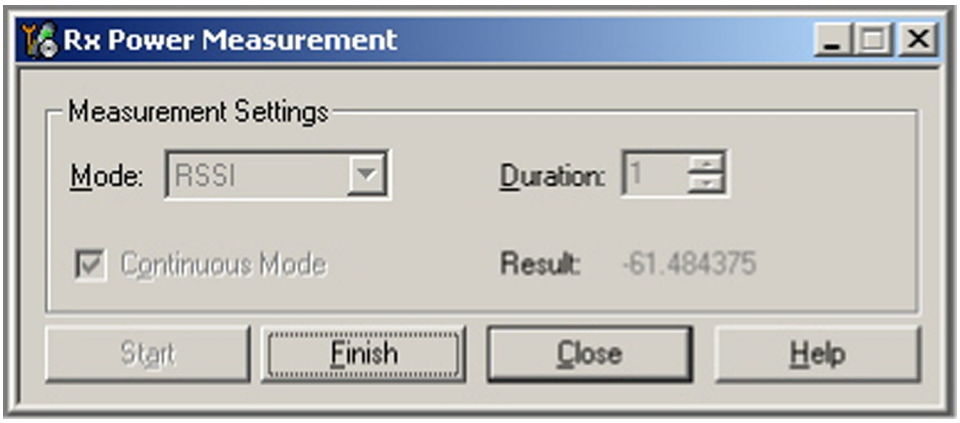

Figure 53 RSSI reading window (WCDMA)

5. To perform the measurement, click **Start**.

Results

RSSI reading value of the selected channel is displayed.

Transmitter troubleshooting

General instructions for Tx troubleshooting

Context

- Tx troubleshooting requires Tx operation.
- Do not transmit on frequencies that are in use!
- Transmitter can be controlled in the local mode for diagnostic purposes.
- The most useful Phoenix tool for GSM transmitter testing is "RF Controls"; in WCDMA transmitter testing the best tool is "Tx Control".
- Tx IQ tuning and Tx power tuning can be also used in some cases.
- Remember that retuning is not a fix! Phones are tuned correctly in production.

The first set of steps instructs how to assemble the test setup. This setup is general for all Tx troubleshooting tasks.

Alternative steps provide specific troubleshooting instructions for *Phoenix* service software. The first section is for the GSM850/EGSM900/GSM1800/GSM1900 bands and the latter for WCDMA.

> **Caution:** Never activate the GSM or WCDMA transmitter without a proper antenna load. There should be always 50 ohm load connected to the RF connector (antenna, RF-measurement equipment or at least 2 watts dummy load), otherwise GSM or WCDMA PA may be damaged.

Steps

1. Connect a test jig to a computer with a DAU-9S cable or to a FPS-10 flash prommer with a modular cable.
   Make sure that you have a PKD-1 dongle connected to the computer's parallel port.
2. Connect a DC power supply to a product-specific module jig.

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Note: When repairing or tuning a transmitter, use an external DC supply with at least 3 A current capability.

Set the DC supply voltage to 12V and set the CU-4 voltage to 3.7V from Phoenix: **Tools -> CU4/ Terminal current consumption**. Move voltage bar in the window to value 3.7V.

3. Connect an RF cable between the RF connector of the product-specific module test jig and measurement equipment or alternatively use a 50 ohms (at least 2 W) dummy load in the module test jig RF connector, otherwise GSM or WCDMA PA may be damaged.

   Note: There are three antenna connectors in the module jig:

   - one for GSM
   - one for WCDMA
   - one for Bluetooth and WLAN

   Make sure that all connections are made to the correct RF connector.

   Normally a spectrum analyser is used as measurement equipment.

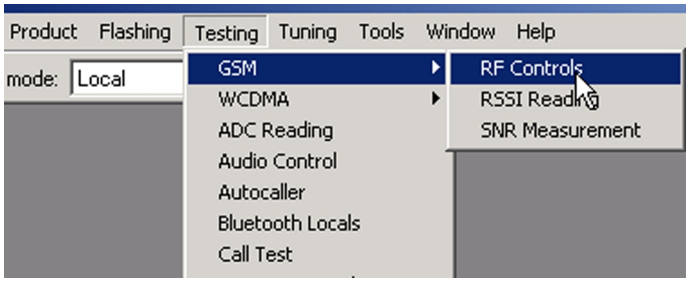
   Note: The maximum input power of a spectrum analyser is +30 dBm.

   To prevent any damage, it is recommended to use 10 dB attenuator on the spectrum analyzer input.

4. Set Tx on.
   i Set the phone module to the test jig and start *Phoenix service software*.
   ii Initialize connection to the phone. (With FPS-10 use FBUS driver when using DAU-9S and COMBOX driver).
   iii From the File menu, choose product: **File -> Choose Product -> xx-x*** (* = type designator of the phone).
   iv From the toolbar, set Operating mode to “Local”.

Alternative steps

- GSM850/EGSM900/GSM1800/GSM1900 troubleshooting
  i From the Testing menu, activate the *RF Controls* window: **Testing -> GSM -> RF Controls** .



  ii In the *RF Controls* window:
  - Select band "GSM850" or “GSM900” or “GSM1800” or “GSM1900” (Default = “GSM900”).
  - Set Active unit to “Tx” (Default = “Rx”).
  - Set Operation mode to “Burst” (Default = “Burst”).
  - Set Tx data type to “All1” (Default = “All1”).
  - Set Rx/Tx channel to 190 on GSM850 or 37 on GSM900 band or 700 on GSM1800 band or 661 on GSM1900 (Defaults).
  - Set Edge to “Off” (Default).
  - Set Tx PA mode to “Free” (Default).

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- Set power level to 5 (Default = 19) on GSM850/GSM900 or to 0 (Default = 15) on GSM1800/GSM1900.

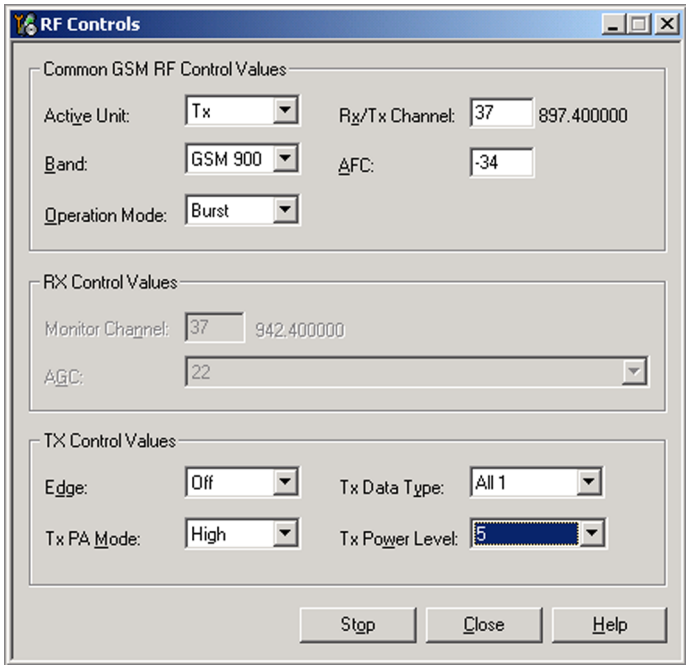


Figure 54 RF Controls window

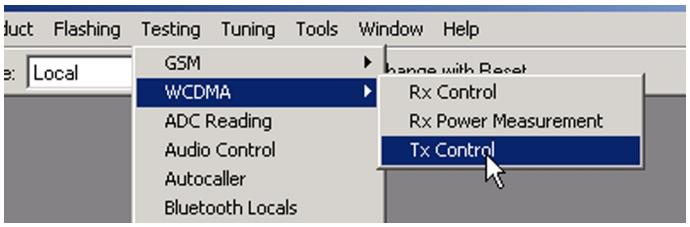
GSM TX output power measurement

Power meter or spectrum analyzer is used for power measurement. Spectrum analyzer settings see section "Tx power level tuning (GSM)".

Power level value (dBm) for selected band and power level is read from the measurement equipment.

- WCDMA troubleshooting

i From the Testing menu, activate the *Tx Control* window:**Testing -> WCDMA -> Tx Control** .



ii In the *Tx Control* window:

- Select the *Algorithm mode* tab.
- Set Start level to "0" dBm (Default = "0").
- Set Step size, Step count and Sequence to "0" (Default = "0").
- Set Scrambling code class to "LONG" (Default = "LONG").
- Set Scrambling code to "16" (Default = "16").
- Set DPDCH Code number to "0", Code class to "2" and Weight to "15" (Defaults).
- Set DPCCH Code number to "0", Code class to "2" and Weight to "8" (Defaults).
- Set Channel to 9750.
- Check the "DPDCH enabled" checkbox (Default).

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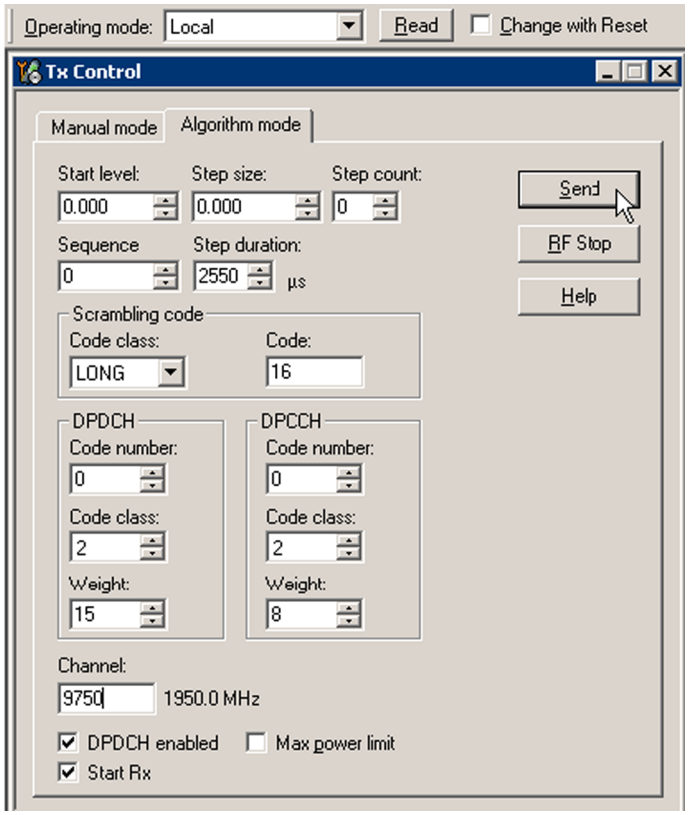

Figure 55 Tx Control window

Next actions

When settings are done, click “Send” to enable them.

If you change the settings (e.g. give a new channel number), you need to click “Stop” and “Send” again.

Checking antenna functionality

The main antenna has two separate antenna elements: GSM and WCDMA.

In the GSM antenna, there is one Feed and one GND contact.

In the WCDMA antenna, there is one Feed and one GND contact.

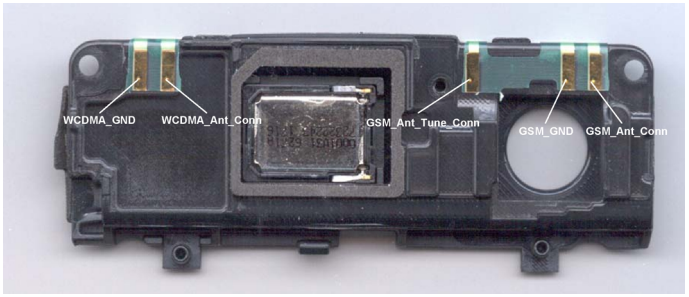

Figure 56 RM-227 antenna

BT / WLAN antenna is a discrete component on the PWB.

RF tunings

Introduction to RF tunings

Phone RF is tuned in production. There is no reason to do the re-calibration unless:

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- FLASH memory chip is corrupted.

Note: RF calibration is always performed with the help of a product-specific module jig, never with an RF coupler. Using an RF coupler in the calibration phase will cause a complete mistuning of the RF side.

Important: **Always** use autotuning. Manual tunings are only required in rare cases.

Cable and adapter losses

RF cables and adapters have some losses. They have to be taken into account when the phone is tuned. As all the RF losses are frequency dependent, the user have to be very careful and understand the measurement setup. The following table presents the RF attenuations of the product-specific module jig:

Table 13 Attenuation values for galvanic RF connection Module Jig MJ-124

Band	Tuning Channel	Attenuation RX	Tolerance RX	Attenuation TX	Tolerance TX
GSM850	190	-0.1	+/- 0.1	-0.1	+/- 0.1
GSM900	37	-0.1	+/- 0.1	-0.1	+/- 0.1
GSM1800	700	-0.5	+/- 0.1	-1.1	+/- 0.1
GSM1900	661	-0.5	+/- 0.1	-0.5	+/- 0.1
WCDMA 2100	9750/10700	-0.5	+/- 0.1	-0.3	+/- 0.1

RF autotuning

RF autotuning

Prerequisites

For information on the recommended test set-up, refer to the corresponding information on the Partner Website or Nokia Online.

Before you can use the autotuning feature, the GPIB driver from the GPIB card vendor must be installed and running.

The file used in autotuning must be in a correct place: **C:\Program Files\Nokia\Phoenix\products\xx-x*\rfconf_xx-x*.xml** (**= indicates the type designator of the phone, e.g. RM-89*)

Context

RF autotuning is performed with the aid of a digital radio communication tester.

Autotuning covers all RF tunings that are needed to perform after RF component repairs.

Note: Do not perform RF autotuning without a proper reason. Autotuning may only be performed after component repairs or if the RF tuning information is lost.

Steps

1. Connect the communication tester to the GPIB bus.
2. Start *Phoenix* service software.
3. Choose **Tools→Options→GPIB Card.**
4. From the **Card Type** drop-down menu, choose the GPIB card used, then click **Start**.

   The name of the communication tester appears in the **Listeners** pane.

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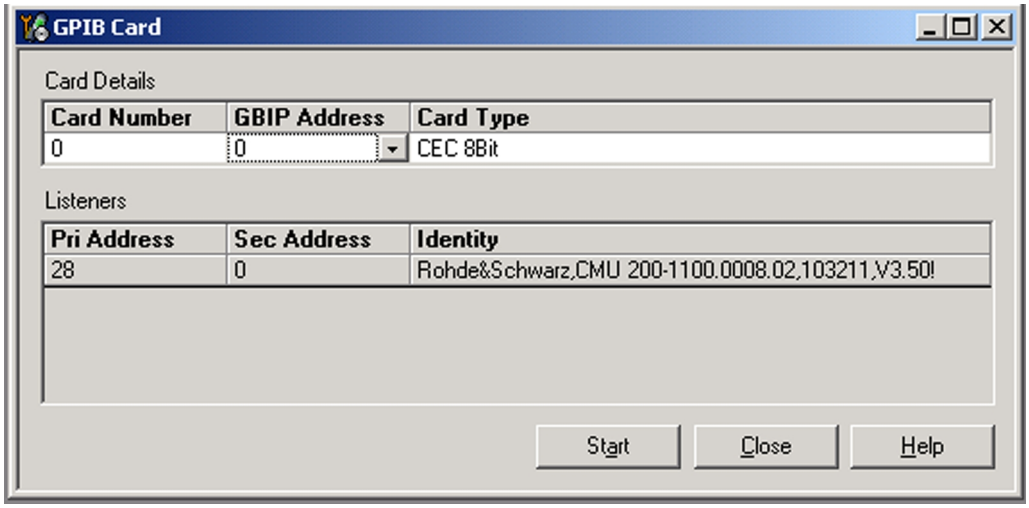
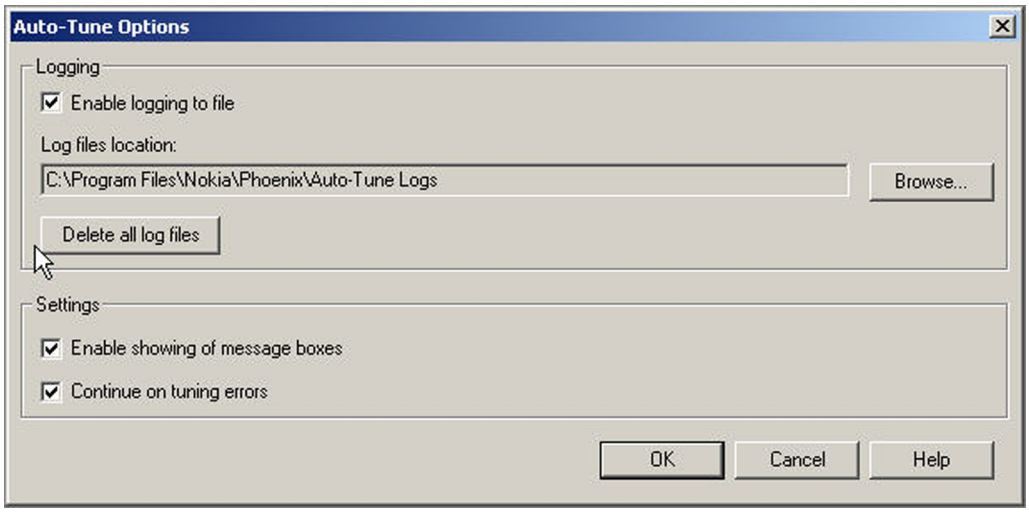
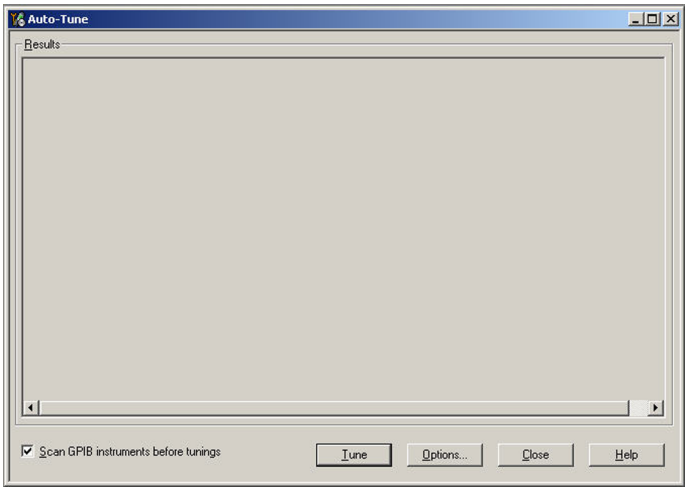


5. To start autotuning, choose **Auto-Tune** from the **Tuning** menu.
6. In the *Auto-Tune* window, click **Options**.
7. In the *Auto-Tune options* window, ensure the **Enable showing of message boxes** check box is checked, and click **OK**.



8. Connect the phone WCDMA RF port to the communication tester, and click **Tune**.



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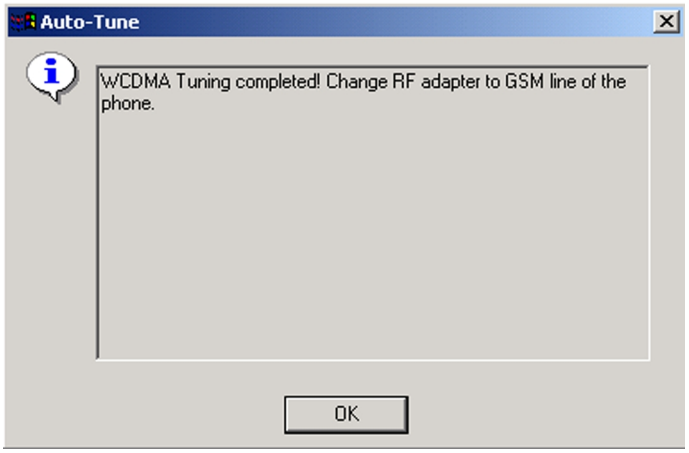
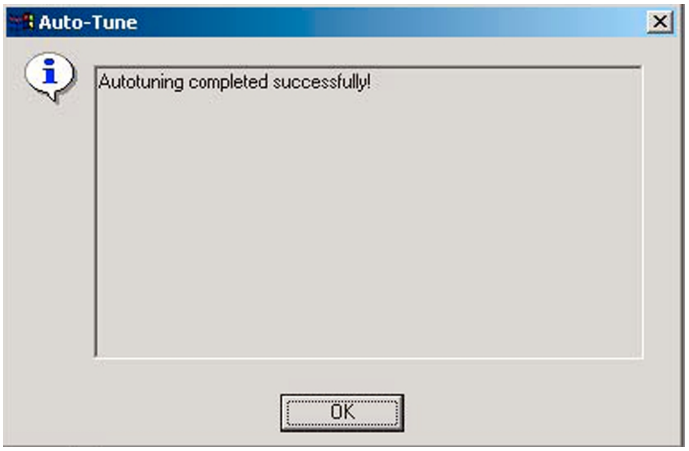
9. Change the phone RF adapter from WCDMA port to GSM port.



10. To complete the RF autotuning, click **OK**.

Results

Autotuning completed successfully! message appears.



RF manual tuning guide

Required manual tunings after component changes

Important: After RF component changes, **always** use autotuning. Manual tunings are only required in rare cases.

System mode independent manual tunings

RF channel filter calibration

Context

RF channel filter calibration tunes the internal low pass filters of Rx and Tx ASICs that limit the bandwidth of BB IQ signals.

One common calibration is made for both GSM and WCDMA.

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Table 14 RF channel filter calibration tuning limits

	Min	Typ	Max
Tx filter	0	10	31
Rx filter	0	16	31
Rx mixer	0	16	31

Steps

1. From the **Operating mode** drop-down menu, set mode to **Local**.
2. Choose **Tuning→Rf Channel Filter Calibration.**
3. Click **Tune**.
4. To save the values to the PMM (Phone Permanent Memory) area, click **Write**.
5. To end the tuning, click **Close**.

Results

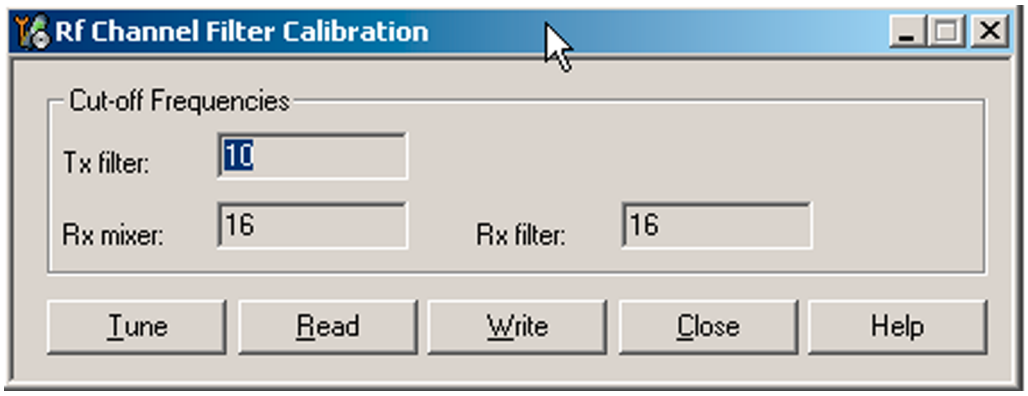

Figure 57 Rf channel filter calibration typical values

PA (power amplifier) detection

Context

The PA detection procedure detects which PA manufacturer is used for phone PAs.

If a PA is changed or if the permanent memory (PMM) data is corrupted, PA detection has to be performed before Tx tunings.

Steps

1. From the **Operating mode** drop-down menu, set mode to **Local**.
2. Choose **Tuning→PA Detection** .
3. Click **Tune**.
4. Check that the detected PA manufacturers are corresponding to the actual chips on the board.
5. To end the procedure, click **Close**.

Temperature sensor calibration

Context

There is a temperature sensor integrated into one of the device ASICs. The ASIC provides DC-voltage, which is temperature dependent.

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Temperature sensor calibration is done in room temperature, in which offset caused by the ASIC variation and AD-converter are nullified.

The module is able to do this calibration by itself, no external equipment is needed.

The temperature of the module and components must be 23 +/-2 degrees.

Steps

1. From the **Operating mode** drop-down menu, set mode to **Local**.
2. Choose **Tuning→Temperature Sensor Calibration** .
3. Click **Tune**.

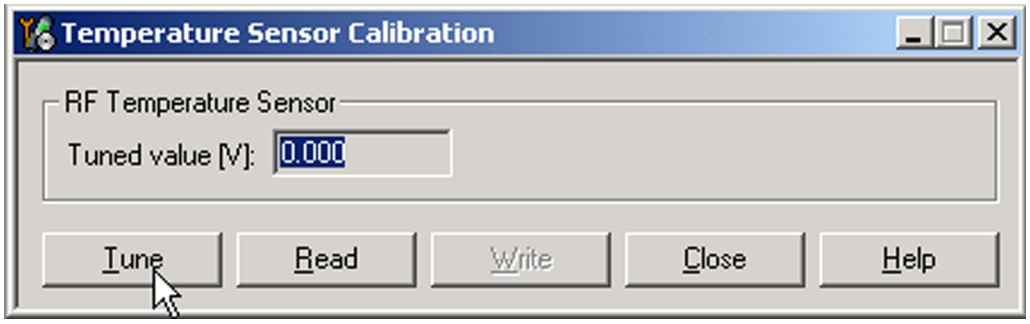


Table 15 Temperature sensor calibration tuning limits

Min	Typ	Max	Unit
-0.25	0	0.25	V

4. To save the calibration values, click **Write**.
5. To finish the calibration, click **Close**.

GSM receiver tunings

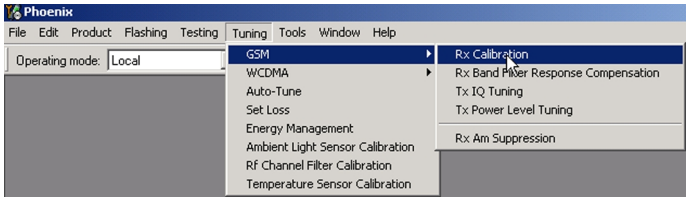
Rx calibration (GSM)

Context

Rx Calibration is used to find out the real gain values of the GSM Rx AGC system and tuning response of the AFC system (AFC D/A init value and AFC slope)

Steps

1. Connect the module jig's GSM connector to signal generator.
2. From the "Operating mode" dropdown menu, set mode to "Local".
3. From the Tuning menu, choose GSM -> Rx Calibration.



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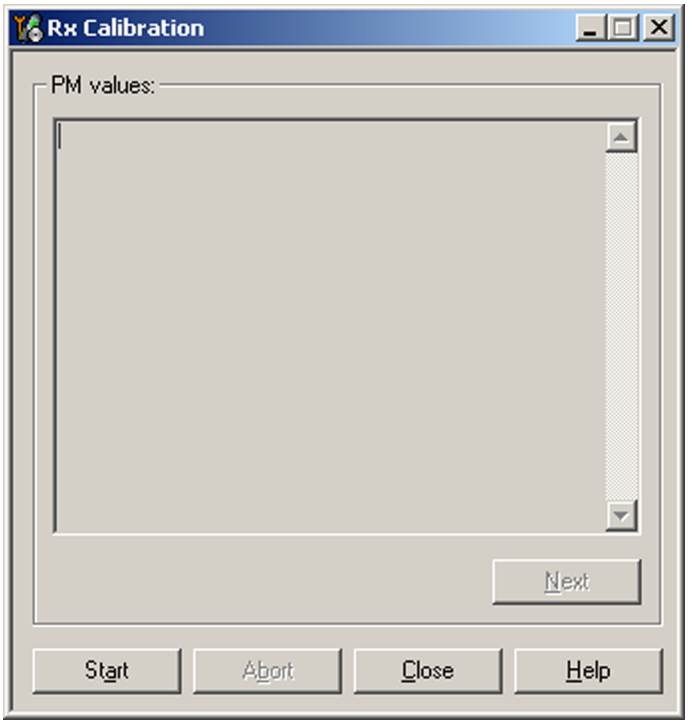
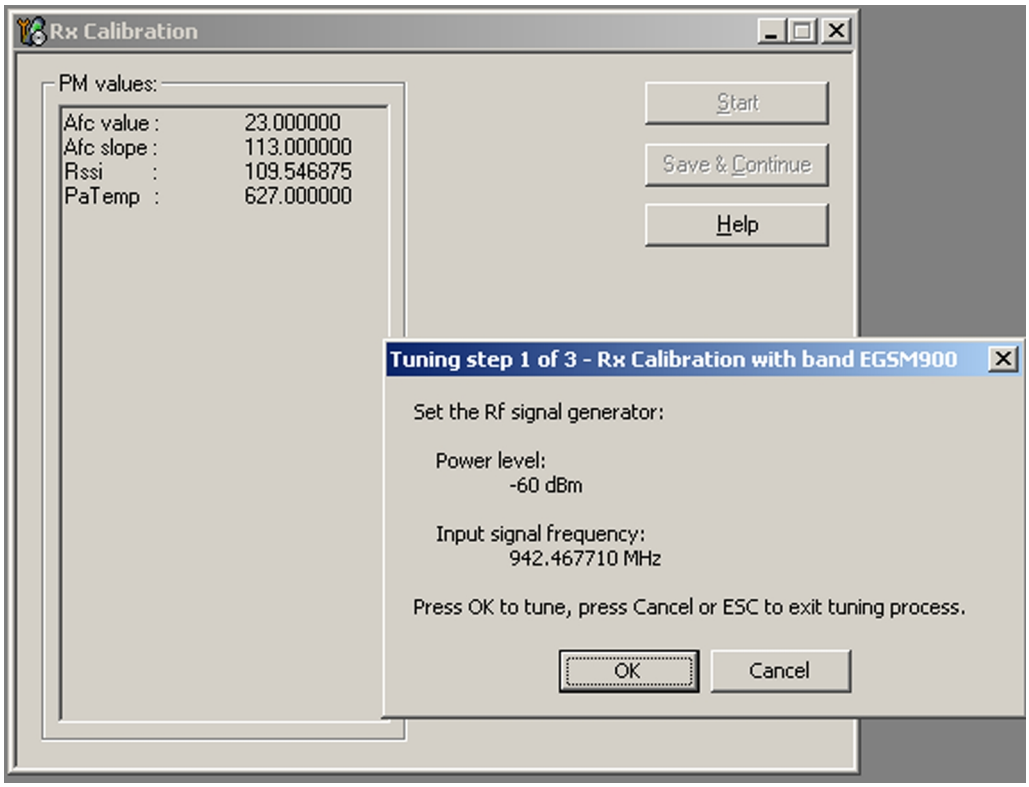
4. Click Start (if not active already).



5. Connect signal generator to the phone and set frequency and amplitude as instructed in the "Rx Calibration with band GSM850" popup window.

   The calibration uses a non-modulated CW signal. Increase the signal generator level by cable attenuation and module jig probe attenuation!



6. To perform tuning, click OK.

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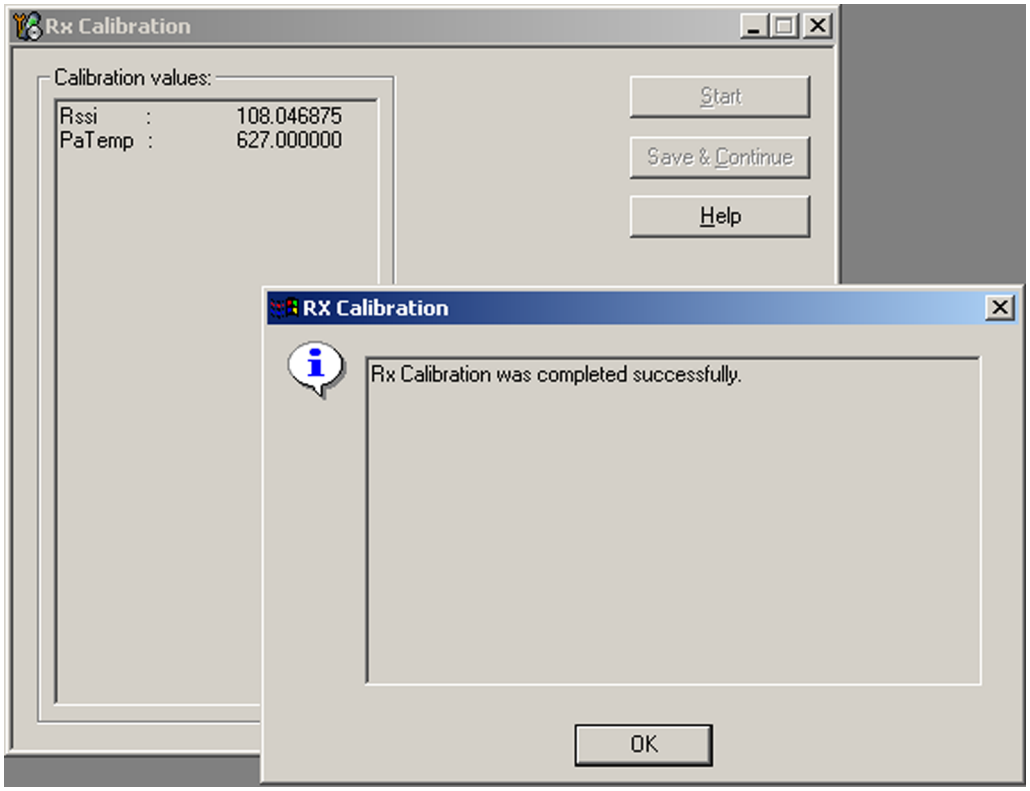
7. Check that the tuning values are within the limits specified in this table:

Table 16 RF tuning limits in Rx calibration

	Min	Typ	Max	Unit
GSM850/GSM900				
AFC Value	-200	-105...62	200	
AFC slope	0	122	200	
RSSI0	106	107...110	114	dB
GSM1800				
RSSI0	104	104...109	114	dB
GSM1900				
RSSI0	104	104...109	114	dB

8. Go to the next band RX calibration by clicking "Next".
9. The last RX calibration is done at GSM1900 band. Click “next” after GSM1900 RX calibration and the tuning values are saved.

Results



Rx band filter response compensation (GSM)

Prerequisites

Rx Calibration must be performed before the Rx Band Filter Response Compensation.

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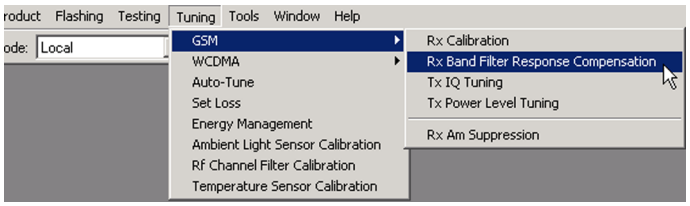
Context

On each GSM Rx band, there is a bandbass filter in RF asic. The amplitude ripple caused by these filters causes ripple to the RSSI measurement and therefore calibration is needed.

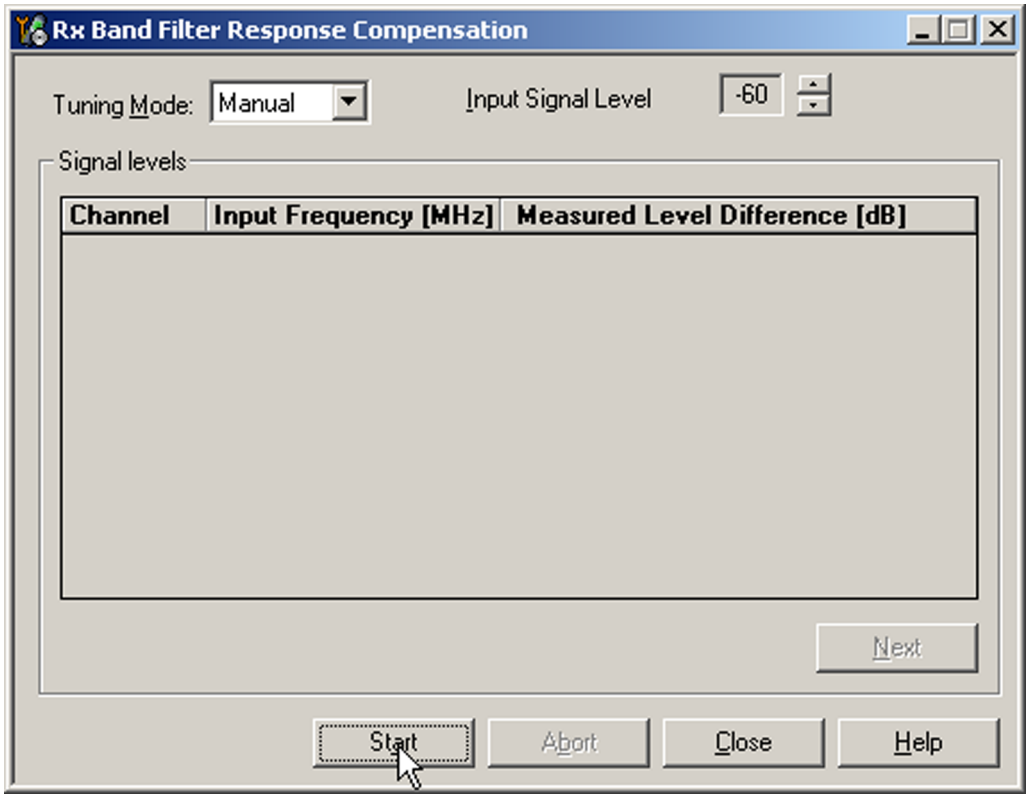
The calibration has to be repeated for each GSM band.

Steps

1. Connect the module jig's GSM connector to the signal generator.
2. From the "Operating mode" dropdown menu, set mode to "Local".
3. From the Tuning menu, choose GSM -> Rx Band Filter Response Compensation.



4. In the *Tuning mode* pane, select **Manual**.
5. Click Start.



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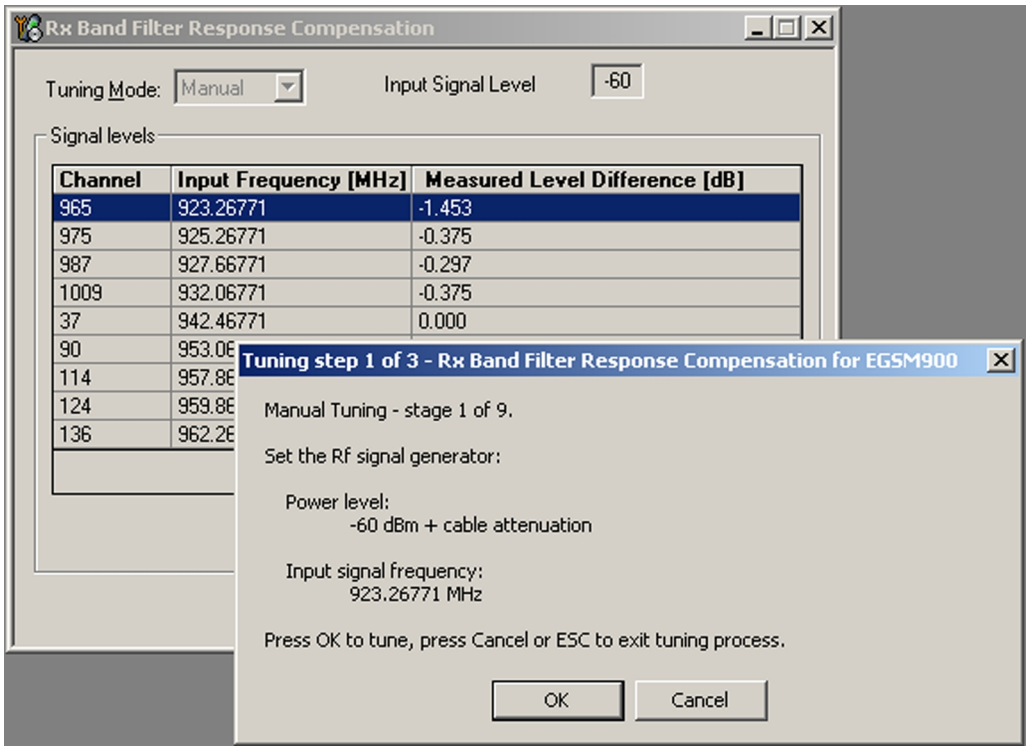
6. Connect the signal generator to the phone and set frequency and amplitude as instructed in the "Rx Band Filter Response Compensation for EGSM900" popup window.



7. To perform tuning, click OK.
8. Go through all 9 frequencies.
9. Check that the tuning values are within the limits specified in the following table:

	Min	Typ	Max	Unit
GSM850/GSM900				
GSM850				
Ch.118 / 867.26771 MHz	-6	-1	2	dB
Ch.128 / 869.26771 MHz	-3	0	2	dB
Ch.140 / 871.66771 MHz	-3	0	2	dB
Ch.172 / 878.06771 MHz	-3	0	2	dB
Ch.190 / 881.66771 MHz	-3	0	2	dB
Ch.217 / 887.06771 MHz	-3	0	2	dB
Ch.241 / 891.86771 MHz	-3	0	2	dB
Ch.251 / 893.86771 MHz	-3	0	2	dB
Ch.261 / 895.86771 MHz	-6	-1	2	dB
GSM900				
Ch. 965 / 923.26771 MHz	-6	-1	2	dB
Ch. 975 / 925.26771 MHz	-3	0	2	dB
Ch. 987 / 927.66771 MHz	-3	0	2	dB

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	Min	Typ	Max	Unit
Ch. 1009 / 932.06771 MHz	-3	0	2	dB
Ch. 37 / 942.46771 MHz	-3	0	2	dB
Ch. 90 / 953.06771 MHz	-3	0	2	dB
Ch. 114 / 957.86771 MHz	-3	0	2	dB
Ch. 124 / 959.86771 MHz	-3	0	2	dB
Ch. 136 / 962.26771 MHz	-6	-1	2	dB
Ch. 965 / 923.26771 MHz	-10	-1	5	dB
Ch. 975 / 925.26771 MHz	-3	0	5	dB
Ch. 987 / 927.66771 MHz	-3	0	5	dB
Ch. 1009 / 932.06771 MHz	-3	0	5	dB
Ch. 37 / 942.46771 MHz	-3	0	5	dB
Ch. 90 / 953.06771 MHz	-3	0	5	dB
Ch. 114 / 957.86771 MHz	-3	0	5	dB
Ch. 124 / 959.86771 MHz	-3	0	5	dB
Ch. 136 / 962.26771 MHz	-10	-1	5	dB
GSM1800				
Ch. 497 / 1802.26771 MHz	-6	-1	3	dB
Ch. 512 / 1805.26771 MHz	-3	0	3	dB
Ch. 535 / 1809.86771 MHz	-3	0	3	dB
Ch. 606 / 1824.06771 MHz	-3	0	3	dB
Ch. 700 / 1842.86771 MHz	-3	0	3	dB
Ch. 791 / 1861.06771 MHz	-3	0	3	dB
Ch. 870 / 1876.86771 MHz	-3	0	3	dB
Ch. 885 / 1879.86771 MHz	-3	0	3	dB
Ch. 908 / 1884.46771 MHz	-6	-1	3	dB
GSM1900				
Ch. 496 / 1927.06771 MHz	-6	-1	5	dB
Ch. 512 / 1930.26771 MHz	-3	0	5	dB
Ch. 537 / 1935.26771 MHz	-3	0	5	dB
Ch. 586 / 1945.06771 MHz	-3	0	5	dB
Ch. 661 / 1960.06771 MHz	-3	0	5	dB
Ch. 736 / 1975.06771 MHz	-3	0	5	dB
Ch. 794 / 1986.66771 MHz	-3	0	5	dB
Ch. 810 / 1989.86771 MHz	-3	0	5	dB
Ch. 835 / 1994.86771 MHz	-6	-1	5	dB

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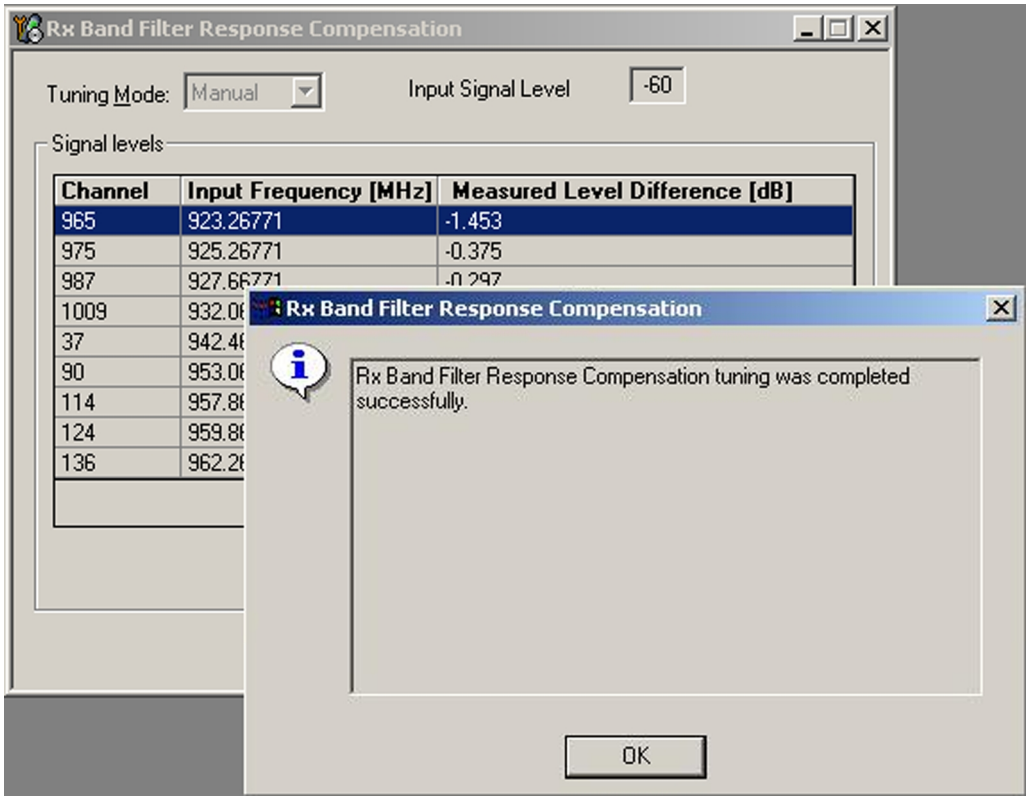
10. If the values are within the limits, click "Next".
11. GSM900 tuning is automatically started. After GSM900 tuning, GSM1800 and GSM1900 tuning is followed.

Results



Rx AM suppression (GSM)

Context

AM suppression is related to ability of the receiver to operate when there is a disturbing AM modulated signal near the received channel signal frequency.

AM suppression is not tunable, it is only a check. In Rx AM suppression, a continuous useful signal accompanied with an AM modulated signal 10 MHz above the current channel is fed to the antenna and RSSI value is read.

Steps

1. Connect the module jig's GSM connector to the signal generator.
2. From the "Operating mode" dropdown menu, set mode to "Local".
3. From the Tuning menu, choose GSM -> Rx AM Suppression.

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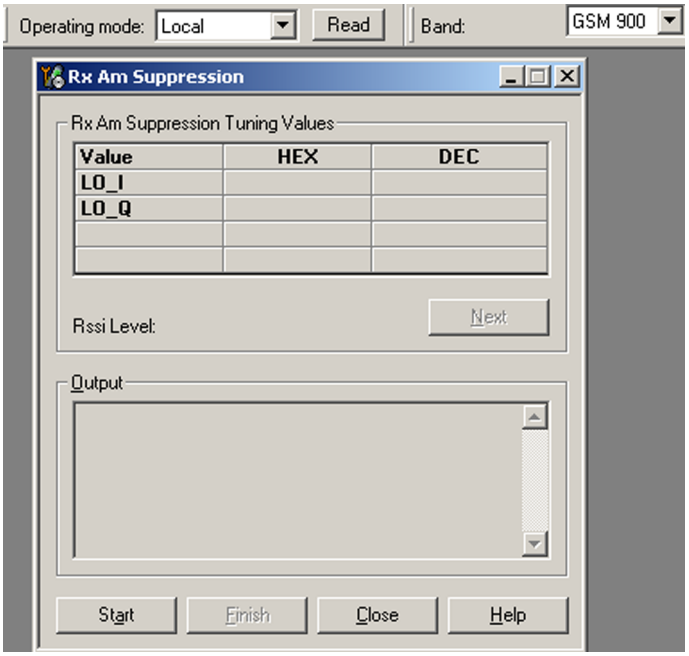
4. Click Start.



5. Connect the signal generator to the phone according to the frequency and modulation parameters displayed in the pop-up window:

Frequency	891.66771 MHz / 952.46771 MHz / 1852.86771 MHz / 1970.06771 MHz (depending on the band used)
Power level	-29 dBm / -29 dBm / -29 dBm / -29 dBm (increase by cable and jig attenuations)
Modulation	AM
AM modulation depth	90%
Modulation signal	50 kHz sinewave (or 15 kHz if 50 kHz is not available)

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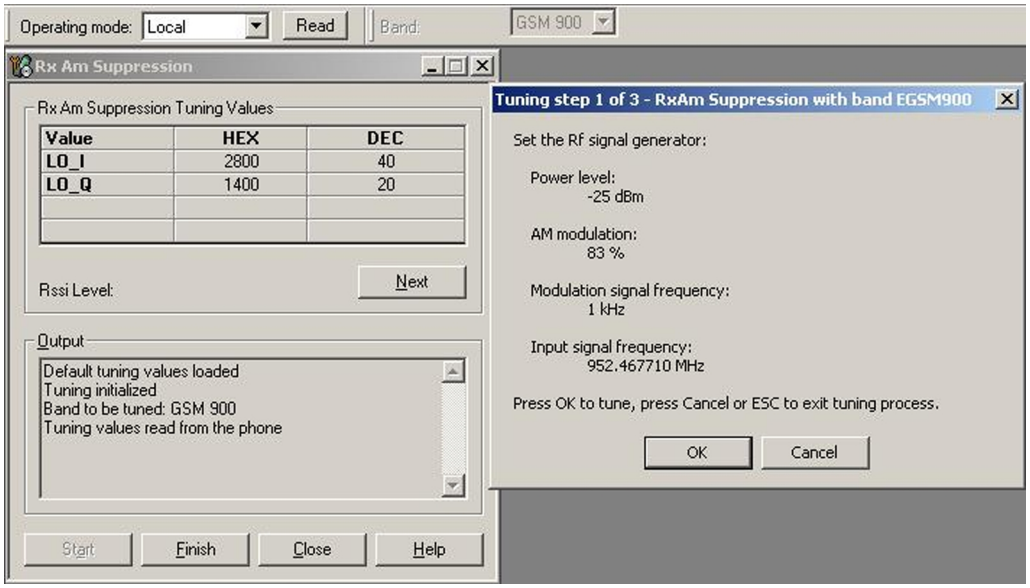
6. Click OK.



7. Check that RSSI level value is between the limits presented in the following table.

Table 17 RSSI level values

Band	Min	Max	Unit
GSM850/GSM900	-115	-95	dB
GSM1800	-115	-95	dB
GSM1900	-115	-96	dB

Note: The limit values are to be used with a low noise signal generator. If other signal generators (for example CMU200 tester or Willtek tester) are used, the limits should be higher.

8. To proceed to the next band, click "Next".

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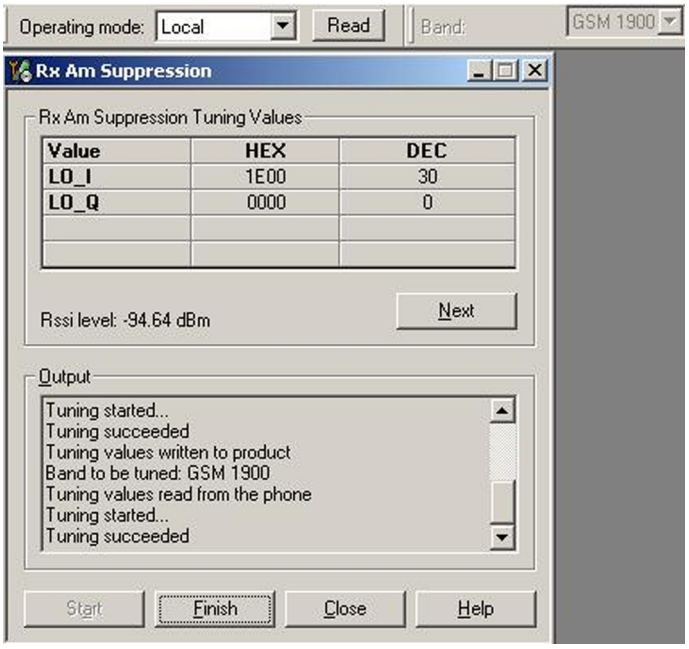
9. To end the tuning, click "Finish" and "Close".



GSM transmitter tunings

Tx IQ tuning (GSM)

Context

- The Tx path branches to I and Q signals at RF I/Q modulator. Modulator and analog hardware located after it cause unequal amplitude and phase disturbance to I and Q signal paths. Tx IQ tuning balances the I and Q branches.
- Tx IQ tuning must be performed on all GSM bands.

Steps

1. Start Phoenix service software.
2. Choose File→Scan Product.
3. From the Operating mode drop-down menu, set mode to Local.
4. Choose Tuning→GSM→Tx IQ Tuning.
5. In the Tx IQ Tuning window, set mode to Automatic.
6. Click Start.

   Wait until the automatic tuning feature has finished and moved the sliders. Values are written to the phone memory automatically. Tuning sliders should be close to the center of the scale after the tuning and within the limits specified in the following table.

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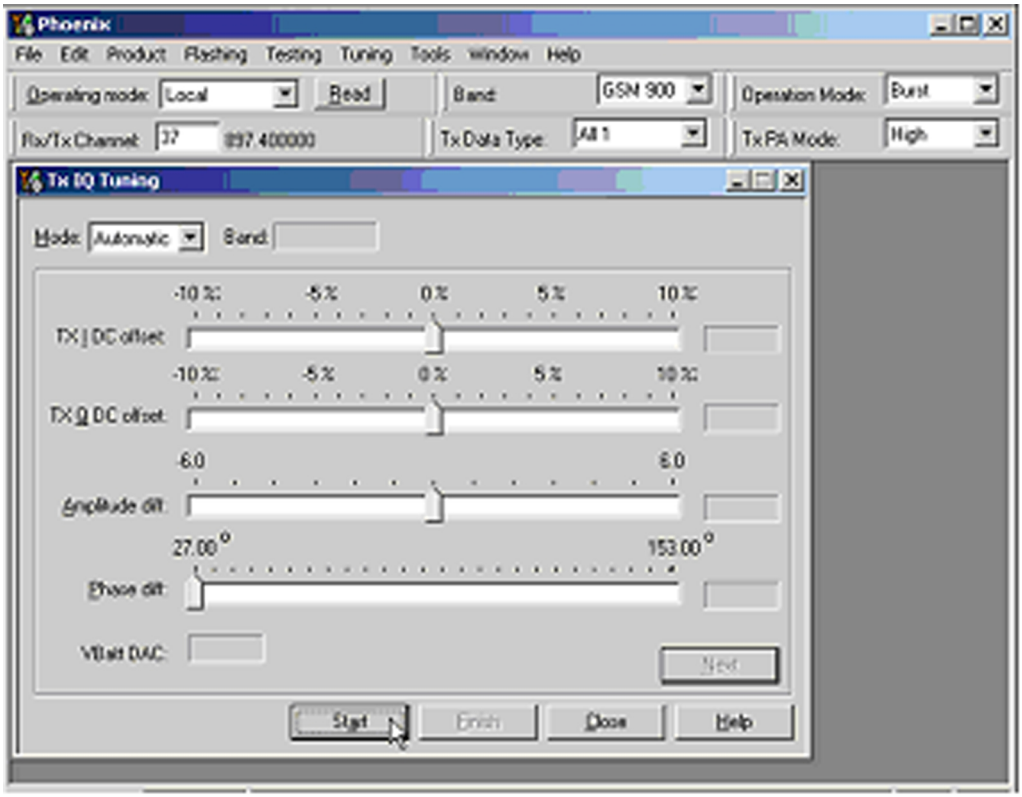

Table 18 TX IQ tuning limits

	Min	Typ	Max	Unit
GSM850 / GSM900				
I / Q DC offset	-6	-0.5 0.5	6	dB
Ampl	-1	0	1	dB
Phase	85	90	95	deg.
GSM1800 / GSM1900				
I / Q DC offset	-6	-0.5 0.5	6	dB
Ampl	-1	0	1	dB
Phase	86	95	105	deg.

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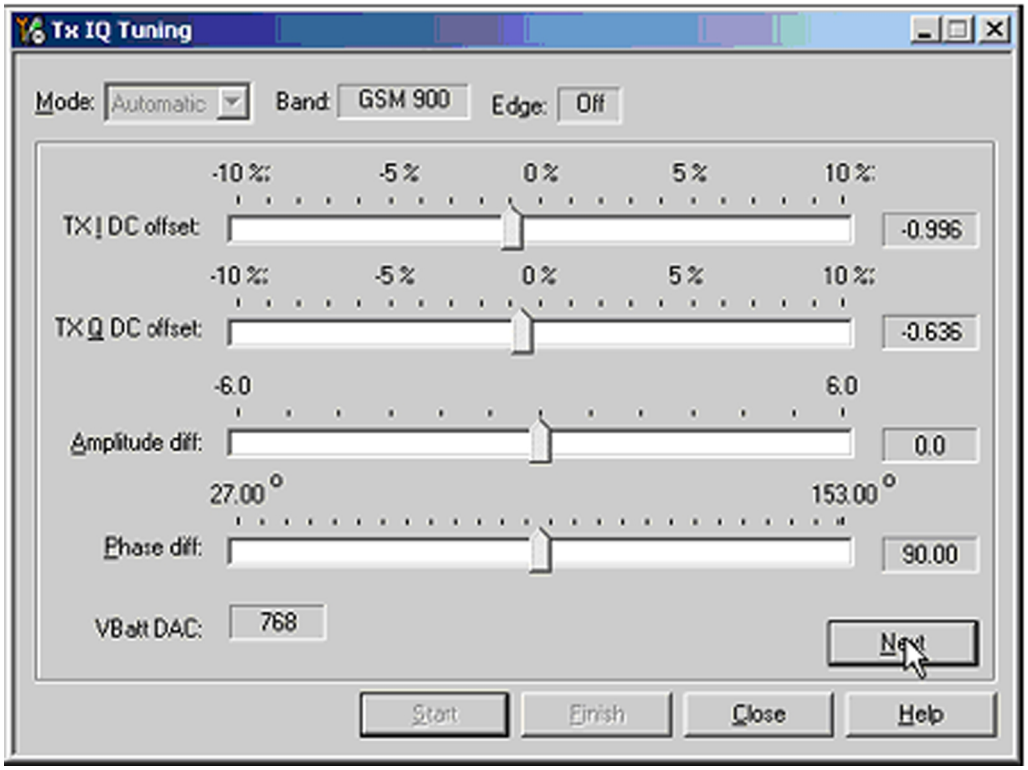
7. When the first values have been written to the phone memory, click Next to continue to the next band.



8. Go through all bands.
9. When all bands have been tuned, click Finish, and Close to end the tuning procedure.

Next actions

If the tuning values are not within the limits specified in the "Tx IQ tuning limits" table, start the procedure again, and check the Tx IQ quality manually.

Tx power level tuning (GSM)

Context

Because of variations at IC process and discrete component values, the actual transmitter RF gain of each phone is different. Tx power level tuning is used to find out mapping factors called 'power coefficients'. These adjust the GSM transmitter output power to fulfill the specifications.

For EDGE transmission the bias settings of the GSM PA are adjusted in order to improve linearity. This affects the PA gain and hence the power levels have to be aligned separately for EDGE transmission.

Tx power level tuning has to be performed on all GSM bands.

Steps

1. Connect the phone to a spectrum analyzer.
2. Start Phoenix service software.
3. From the "Operating mode" dropdown menu, set mode to "Local".

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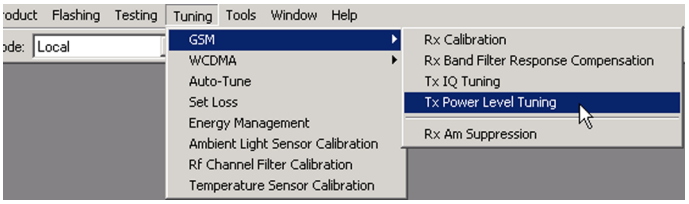
4. From the Tuning menu, choose GSM -> Tx Power Level Tuning.



5. Set the spectrum analyzer for power level tuning:

Table 19

Frequency	Channel frequency (836.6MHz GSM850, 897.4MHz GSM900, 1747.8MHz GSM1800, 1880MHz GSM1900)
Span	200 kHz
Sweep time	3 s
Trigger	Video triggering: Free run
Resolution BW	1 MHz (min. 600 kHz)
Video BW	3 kHz
Reference level offset	Sum cable attenuation with module jig attenuation
Reference level	35 dBm
Detector	Max Peak

A power meter with a peak power detector can be also used. Remember to take the attenuations in the account!

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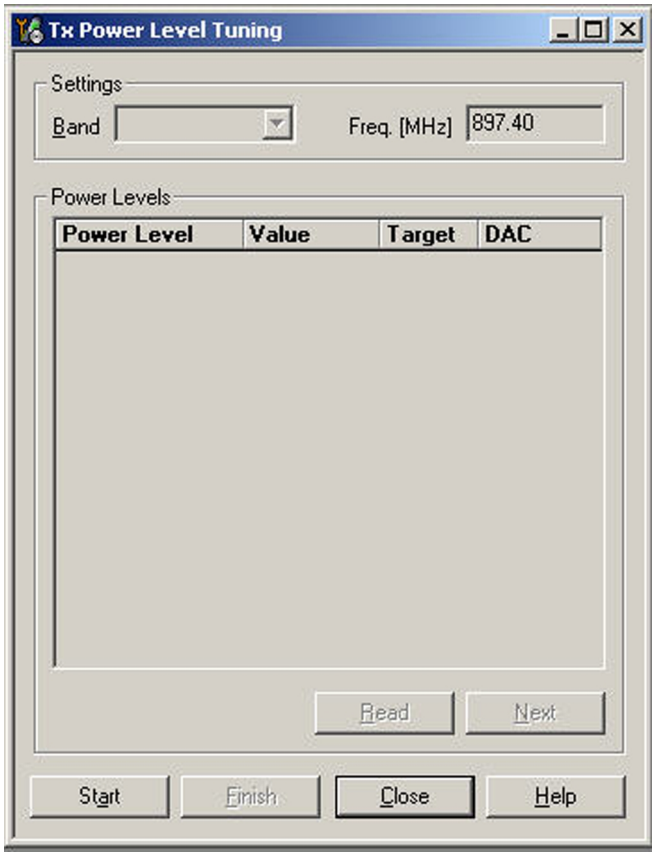
6. Click Start.



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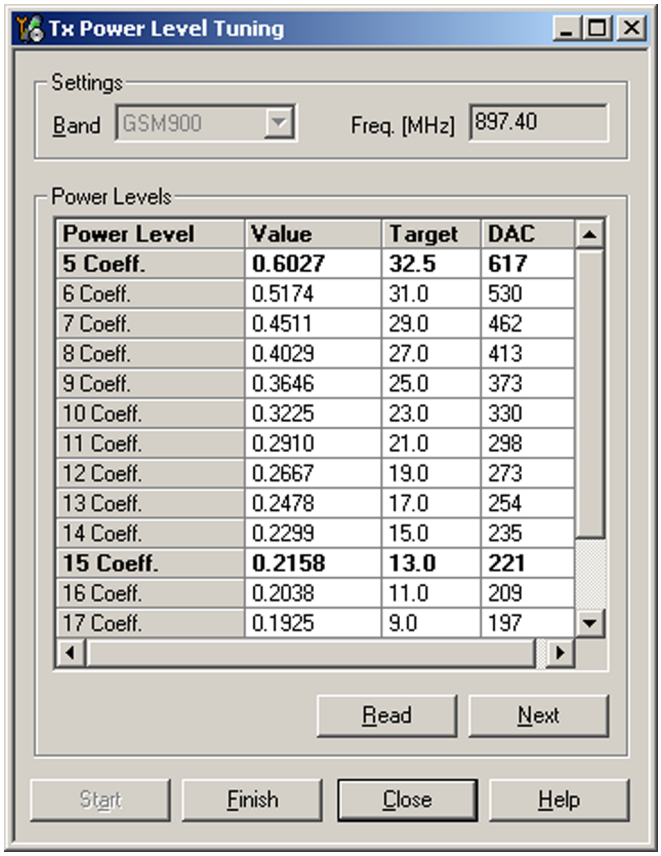
7. Adjust power levels **5**, **15** and **19** to correspond the "Target dBm" column by pressing + or – keys.



Check that the coeffiecient values are within the limits specified in the following table.

	Min	Typ	Max
GSM850/GSM900 EDGE off			
PL5 coefficient	0.45	0.626	0.73
PL15 coefficient		0.234	
PL19 coefficient	0.12	0.195	0.3
GSM850/GSM900 EDGE on			
PL8 coefficient	0.35	0.419	0.6
PL15 coefficient		0.247	
PL19 coefficient	0.12	0.204	0.3
GSM1800 EDGE off			
PL0 coefficient	0.45	0.51	0.7
PL11 coefficient		0.219	
PL15 coefficient	0.12	0.185	0.3
GSM1800 EDGE on			
PL2 coefficient	0.35	0.394	0.6
PL11 coefficient		0.23	

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	Min	Typ	Max
PL15 coefficient	0.12	0.194	0.3
GSM1900 EDGE off			
PL0 coefficient	0.45	0.482	0.7
PL11 coefficient		0.218	
PL15 coefficient	0.12	0.184	0.3
GSM1900 EDGE on			
PL2 coefficient	0.35	0.377	0.6
PL11 coefficient		0.23	
PL15 coefficient	0.12	0.193	0.3

8. If the values are within the limits, If the values are within the limits, proceed to EDGE tuning by clicking **Next**.
9. Change video averaging to 50 in EDGE tuning if possible (remember to use spectrum analyzer's PEAK detector; some spectrum analyzer cannot use averaging when using PEAK detector).
10. Tune EDGE power levels to the corresponding target power levels.

    Only power levels **8**, **15** and **19** are tuned in GSM900 and **2**, **10** and **15** in GSM1800/1900.
11. Proceed to the next band by pressing **Next**.
12. When the tuning is completed, close the Tx Power Level Tuning window.

WCDMA receiver tunings

RX calibration (WCDMA)

Context

RX calibration tuning is used to find out the real gain values of the WCDMA Rx AGC system and converters.

Steps

1. Connect the GSM connector of the module jig to a signal generator.
2. From the **Operating mode** drop-down menu, set mode to **Local**.
3. Choose **Tuning→WCDMA→RX Calibration** .

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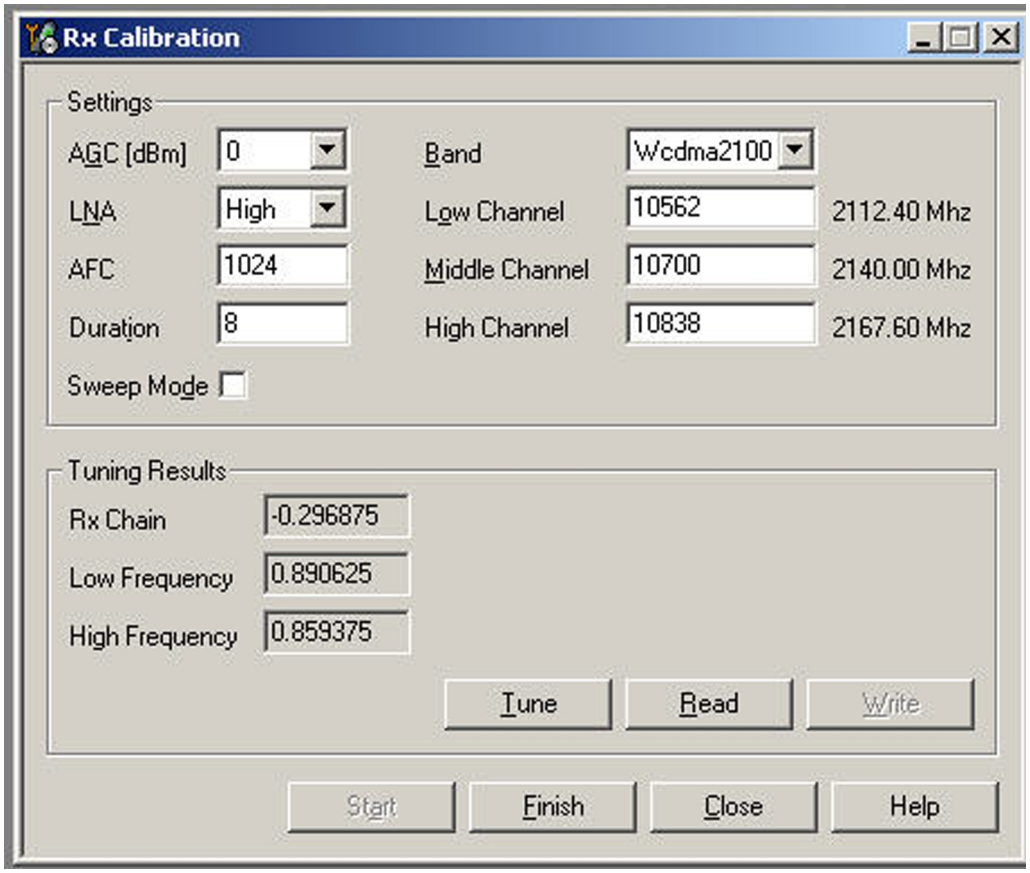
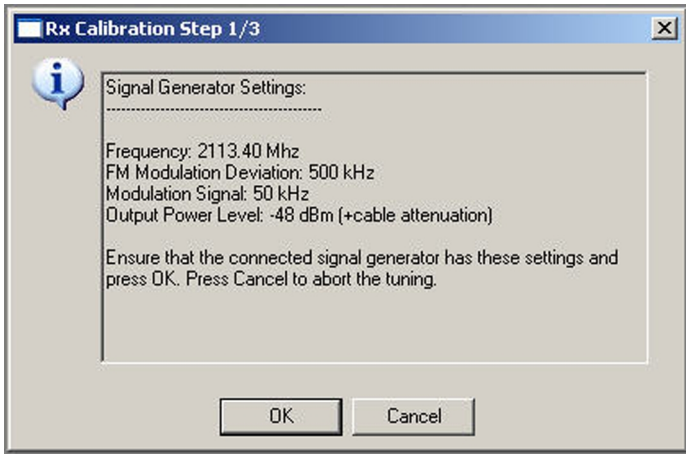
4. Click **Start** and **Tune**.



5. Setup the signal generator to correspond the values in the *RX Calibration* pop-up window and click **OK**. RX Calibration includes 3 steps calibration with 3 frequencies. Click "OK" after each step.



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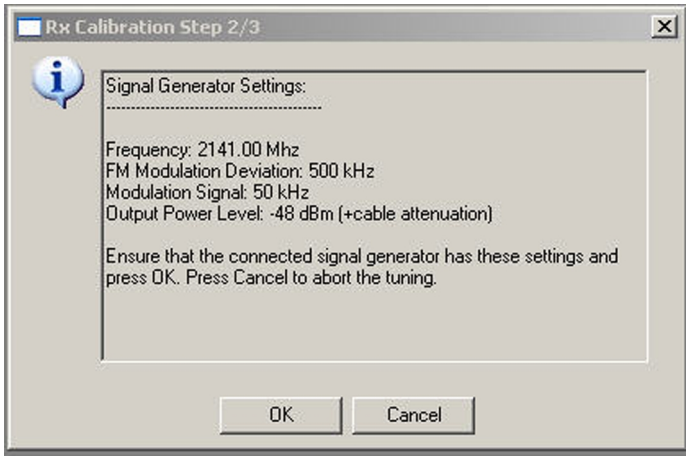

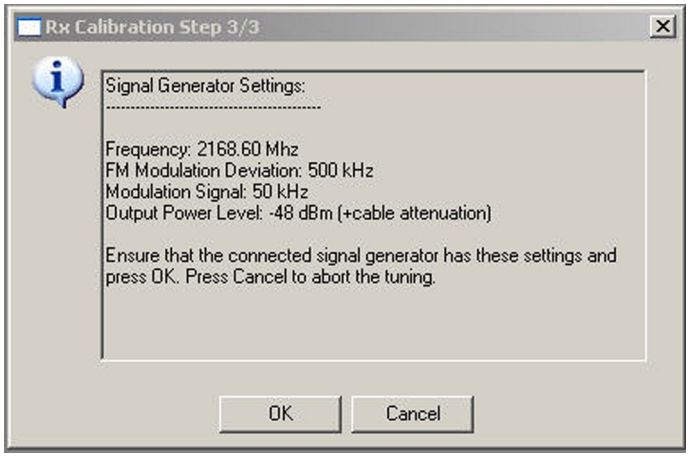

6. Check that the *Rx chain* value in *Tuning Results* is within the limits presented in the following table.

	Min	Typ	Max	Unit
RX chain	-6	-2... 2	6	dB
Low freq	-3	-1... 2	3	
High freq	-3	-1... 2	3	

i If the RX calibration values are within the limits, click **Write** and **Finish** to save the results to the phone.

7. To close the *Rx AGC Alignment* window, click **Close**.

WCDMA transmitter tunings

Tx AGC & power detector (WCDMA)

Context

Tx AGC & power detector tuning has two purposes:

- to enable the phone to select the correct TxC value accurately in order to produce the required RF level
- to enable the phone to measure its own transmitter power accurately

Steps

1. From the **Operating mode** drop-down menu, set mode to **Local**.

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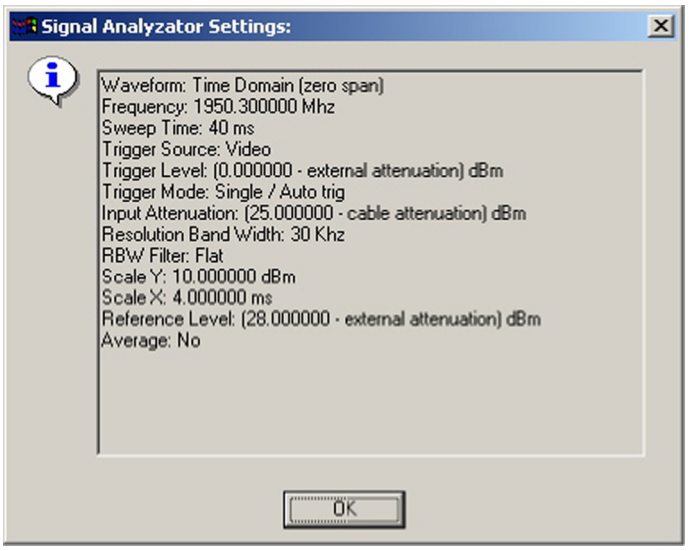
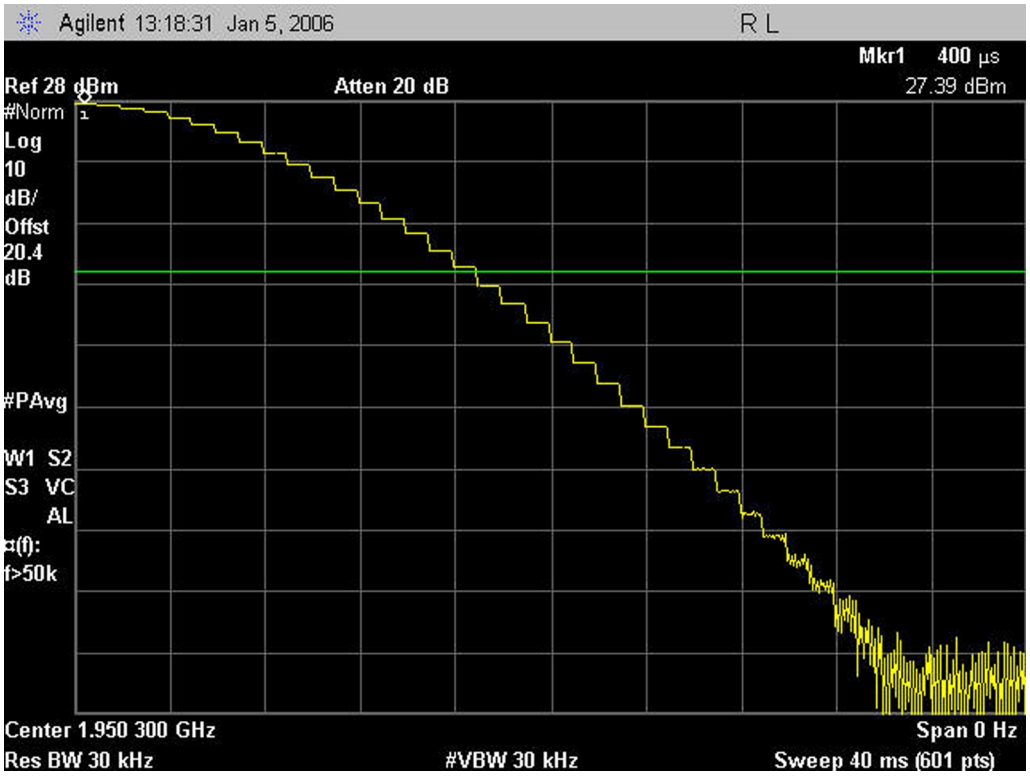
2. Choose **Tuning→WCDMA→TX AGC And Power Detector Tuning.**
3. Click **Start**.
4. In the *Wide Range* pane, click **Tune** (the leftmost **Tune** button).
5. Set up the spectrum analyzer in the following way:



6. After setting the spectrum analyzer, click **OK**.
7. Measure the power levels with a marker and fill them to the table starting from the highest one. The lowest power level filled to the table should be at least <-50 dBm. Measured power levels must be monotonously decreasing.



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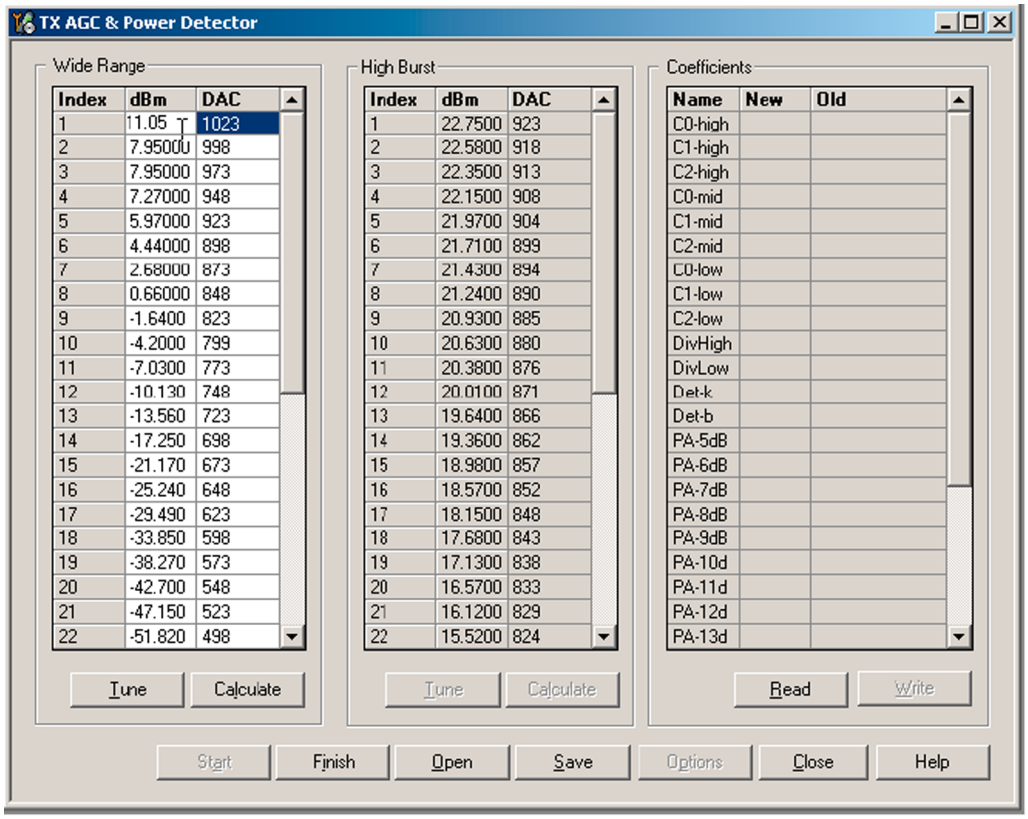
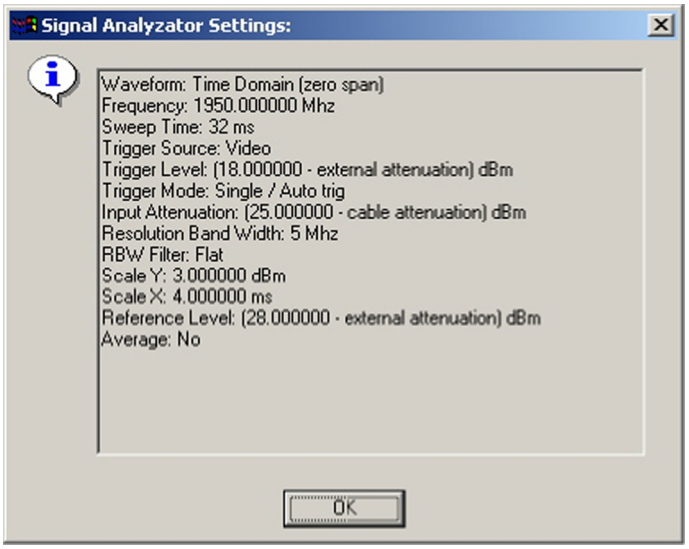
8. Fill in the power level values (in dBm) to the *Wide Range* table.



9. In the *Wide Range* pane, click **Calculate**.
10. In the *High Power Burst* pane, click **Tune**.
11. Adjust the spectrum analyzer according to the following settings (in addition depending on spectrum analyzer use 30 kHz video bandwidth):



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12. Measure the power levels with a marker and fill them to the table starting from the highest one. Measured power levels must be monotonously decreasing.

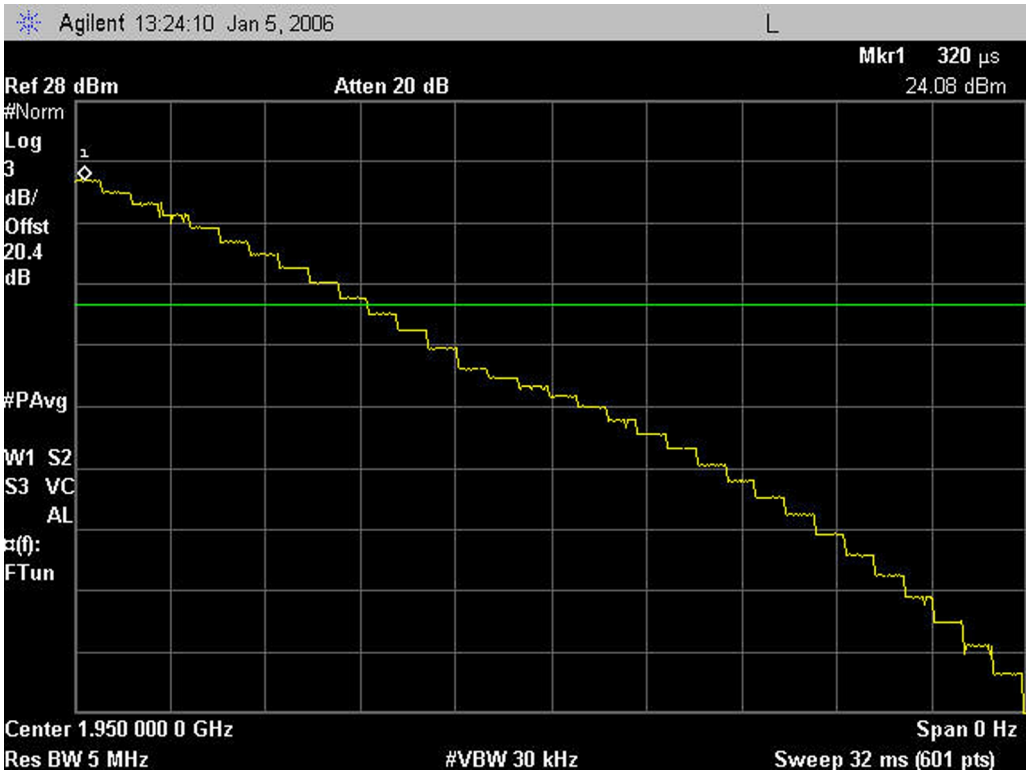

Figure 58 High burst measurement

13. In the *High Burst* pane, click **Calculate**.
14. Check that the calculated values are within the limits specified in the following table:

	Min	Max
C0-high	-0.5	5
C1-high	-50	50
C2-high	400	900
C0-mid	-0.7	0.7
C1-mid	0	50
C2-mid	400	900
C0-low	-4	4
C1-low	-400	440
C2-low	-10000	15000
Det-k	100	220
Det-b	0	150

15. To save the coefficients to the phone, click **Write**.
16. To close the *Tx AGC & Power Detector* window, click **Close**.
17. Choose **Testing→WCDMA→ Tx Control.**

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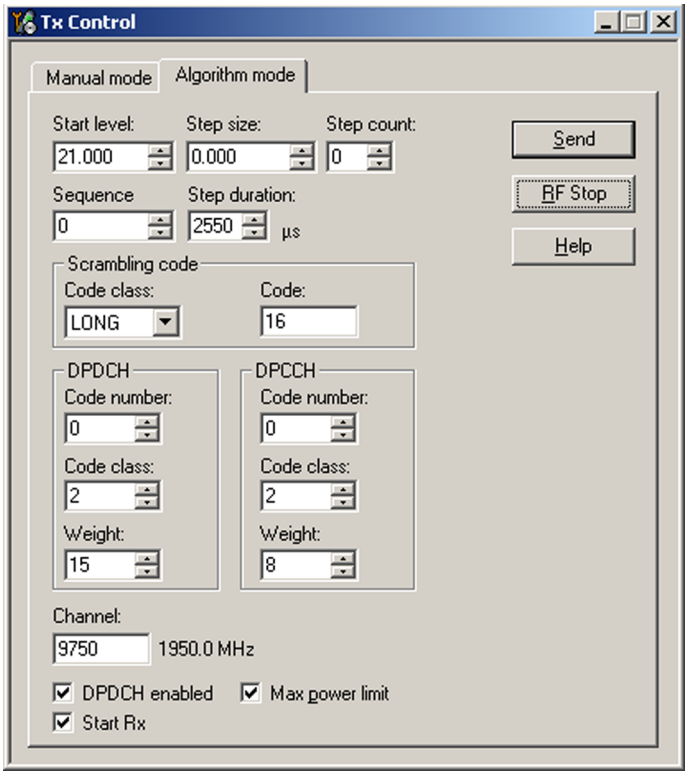
18. Select the *Algorithm* mode tab.



19. Write the target power level 28 dBm to the *Start level* box and check the **Max power limit** check box (detector calibration check). Write "1" to *Sequence* box.
20. Setup the spectrum analyzer with the following settings:

Table 20

Center frequency	1950.0 MHz
Span	0 Hz
Reference level offset	Cable attenuations + adapter attenuation
Reference level	28 dBm or -20 dBm depending on the level measured
Input attenuation	Automatic
Resolution bandwidth	5 MHz
Video bandwidth	5 MHz (depending on spectrum analyzer use 30 kHz VBW)
Sweep time	5 ms
Detector	RMS detector
Average	No
Trigger level	Video 0 dBm or -45 dBm

21. Measure the WCDMA output power. It should be around 23.5 dBm.
22. Click **RF Stop** and uncheck the **Max power limit** check box.

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23. Repeat steps **19** to **23** for levels +19, +7, 0, -20 and –40 dBm.

    The measured output power may not differ more than +-2 dB from the requested value at level +19 dBm and no more than +-4 dB on lower levels.

    Remember to stop the RF before sending new data.

Tx band response calibration (WCDMA)

Context

The purpose of this tuning operation is to calibrate the WCDMA Tx performance. It defines the power detector and Tx frequency compensation values. However, before starting this tuning procedure, it is necessary to carry out Tx AGC & Power Detector Calibration tuning. This is because its results will be needed for this tuning operation.

- In the *Tuning Settings* pane, it is possible to edit the numbers of channels used in this tuning operation.
- If the **Calibrate Detector Response** check box is checked, only Tx response is calibrated. Zero is written to the power detector compensation values block in the permanent memory (PM) of the terminal.
- **Detector Calibration level** shows the power level used for calibrating the power detector in this tuning procedure.
- **Tx Calibration level** shows the power level used for calibrating tx frequency in this tuning procedure.
- In *Measured Power Levels* pane, you can insert the dBm values read from the power meter.
- In *Tuned Values* pane, the values that are stored in the permanent memory (PM) of the terminal in Current columns are shown.
- New values are added to *New* column when the **Calculate** button is clicked.
- **Abort** button aborts the tuning operation without saving the tuned values.
- **Read** button reads the tuned values in the PM of the terminal, and displays them in the *Tuned Values* pane in in the *Current* column.

Steps

1. Start *Phoenix* service software.
2. Choose **File→Scan Product** .
3. From the **Operating mode** drop-down menu, set mode to **Local**.
4. Choose **Tuning→WCDMA→Tx Band Response Calibration** .

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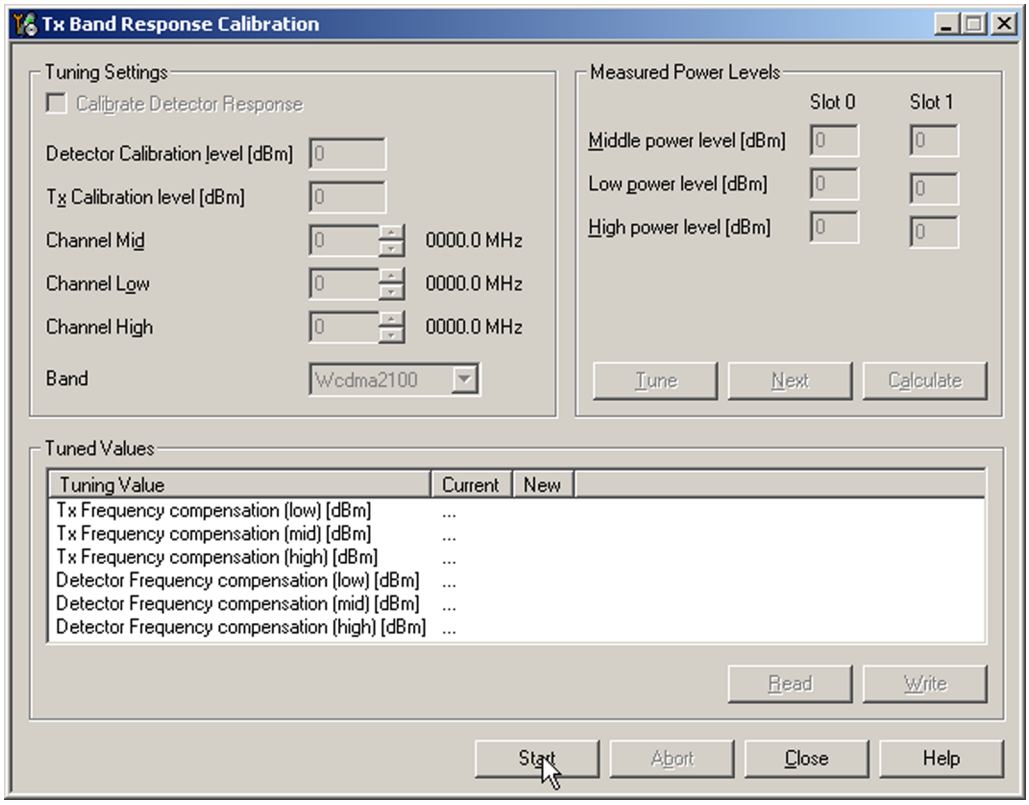
5. Click **Start**.



The current values are shown in the *Tuned Values* pane.

6. Click **Tune**.
7. Connect the spectrum analyzer to the terminal, and set it to **Channel Mid** frequency. Use spectrum analyzer's RMS detector and depending on spectrum analyzer use 30 kHz video bandwidth.
8. Read the values of slot 0 and slot 1 from the power meter and enter them to **Middle power level** fields in the **Measured Power Levels** pane.

   Slot 0 is used for detector calibration and slot 1 for Tx calibration.
9. Click **Next**.
10. Switch the power meter to **Channel Low** frequency.
11. Read the values from the power meter, and enter them to **Low power level** fields.
12. Switch the power meter to **Channel High** frequency.
13. Read the values from the power meter, and enter them to **High power level** fields.
14. Click **Next**.
15. Click **Calculate**.

    The tuned values are shown in the *Tuned Values* pane in the *New* column.
16. Check that the tuned values are within the limits presented in the following table. If they are OK, click **Yes**.

	Min	Max
Tx Freq Comp (the first and last value)	-4	+4

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17. To save the tuned values to the terminal, click **Write**.
18. Close the *Tx Band Response Calibration* window.

Tx LO leakage (WCDMA)

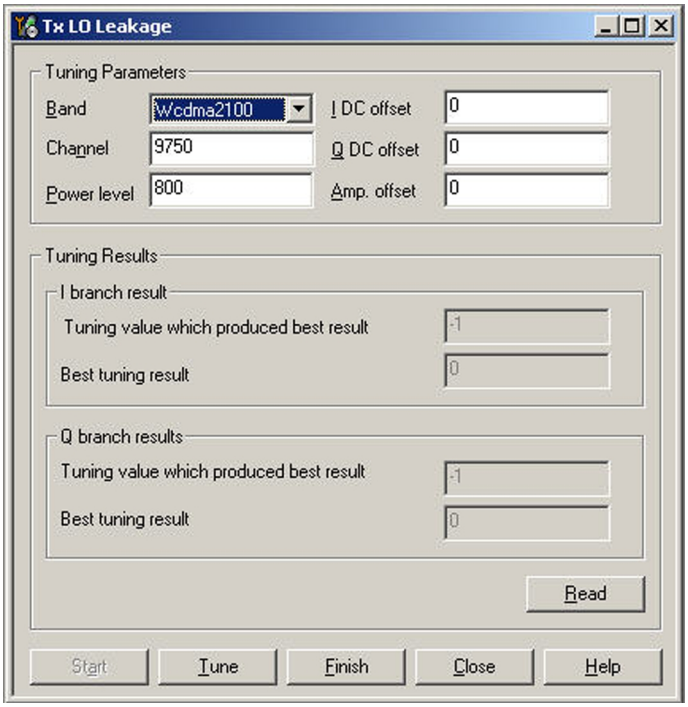
Context

The purpose of Tx LO leakage tuning is to minimize the carrier leakage of the IQ-modulator which is caused by the DC offset voltages in the Tx IQ-signal lines and in the actual IQ modulator.

The tuning improves WCDMA Tx AGC dynamics at low power levels. A self-calibration routine selects the best combination for internal control words in order to produce minimum LO leakage.

Steps

1. From the **Operating mode** drop-down menu, set mode to **Local**.
2. Choose **Tuning→WCDMA→ Tx LO Leakage** .
3. Click **Tune**.



4. Click **Finish** and then **Close**.

WLAN troubleshooting

Introduction to WLAN troubleshooting

This section introduces the main steps in WLAN troubleshooting flow.

Follow the instructions in WLAN functionality test using SB-7 and Phoenix (page 7–42) and WLAN failure troubleshooting (page 7–44).

> **Note:** WLAN power level tuning must be performed if WLAN ASIC or BTH/WLAN front-end module is changed.

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WLAN functionality test using SB-7 and Phoenix

Steps

1. Place the phone on the SB-7 WLAN test box, see figure below.

2. Start *Phoenix* service software and turn the phone to the local mode.

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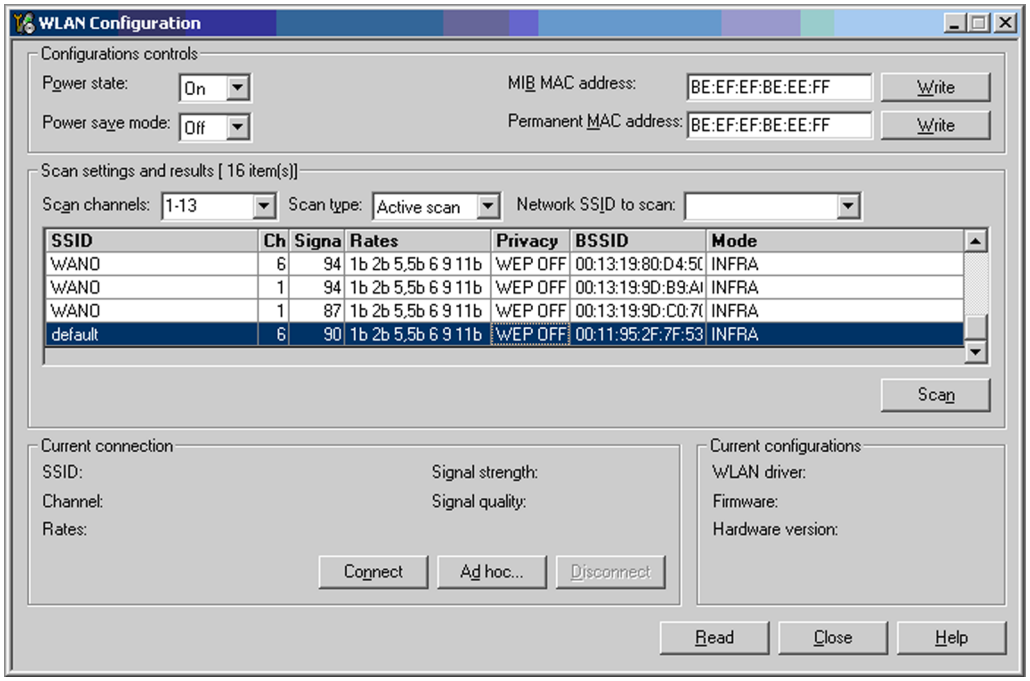
3. From the **Testing** menu, choose **WLAN Configuration**, the following window should come up:



4. Turn the **Power state: On** and press **Scan**.
5. After few seconds, list of found WLAN networks should be updated. If WLAN is working, and at least a station with SSID name **default**, should be found.

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WLAN failure troubleshooting

Troubleshooting flow

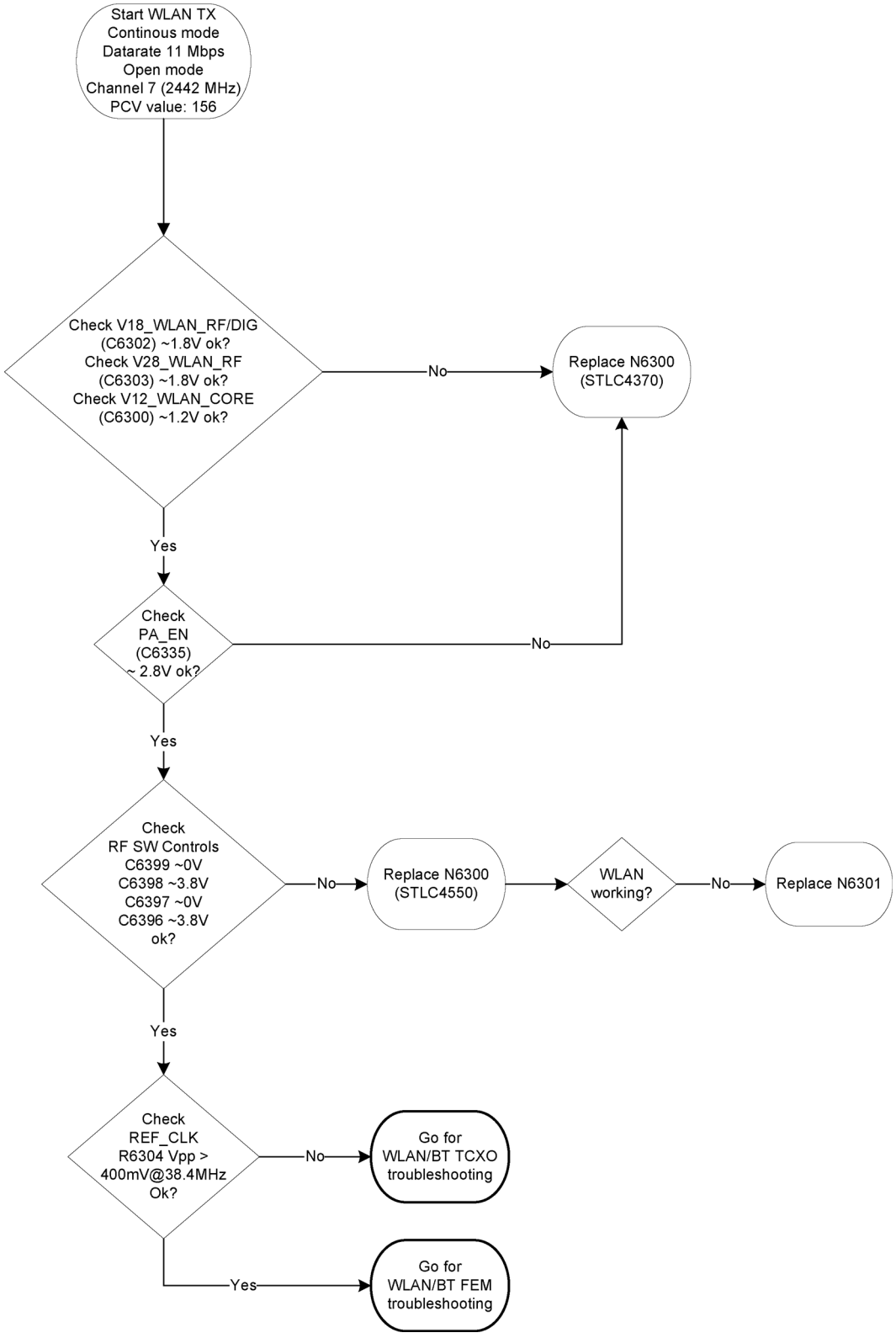

Figure 59 WLAN ASIC troubleshooting

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Note: Check WLAN ASIC troubleshooting before WLAN / BT TCXO troubleshooting.

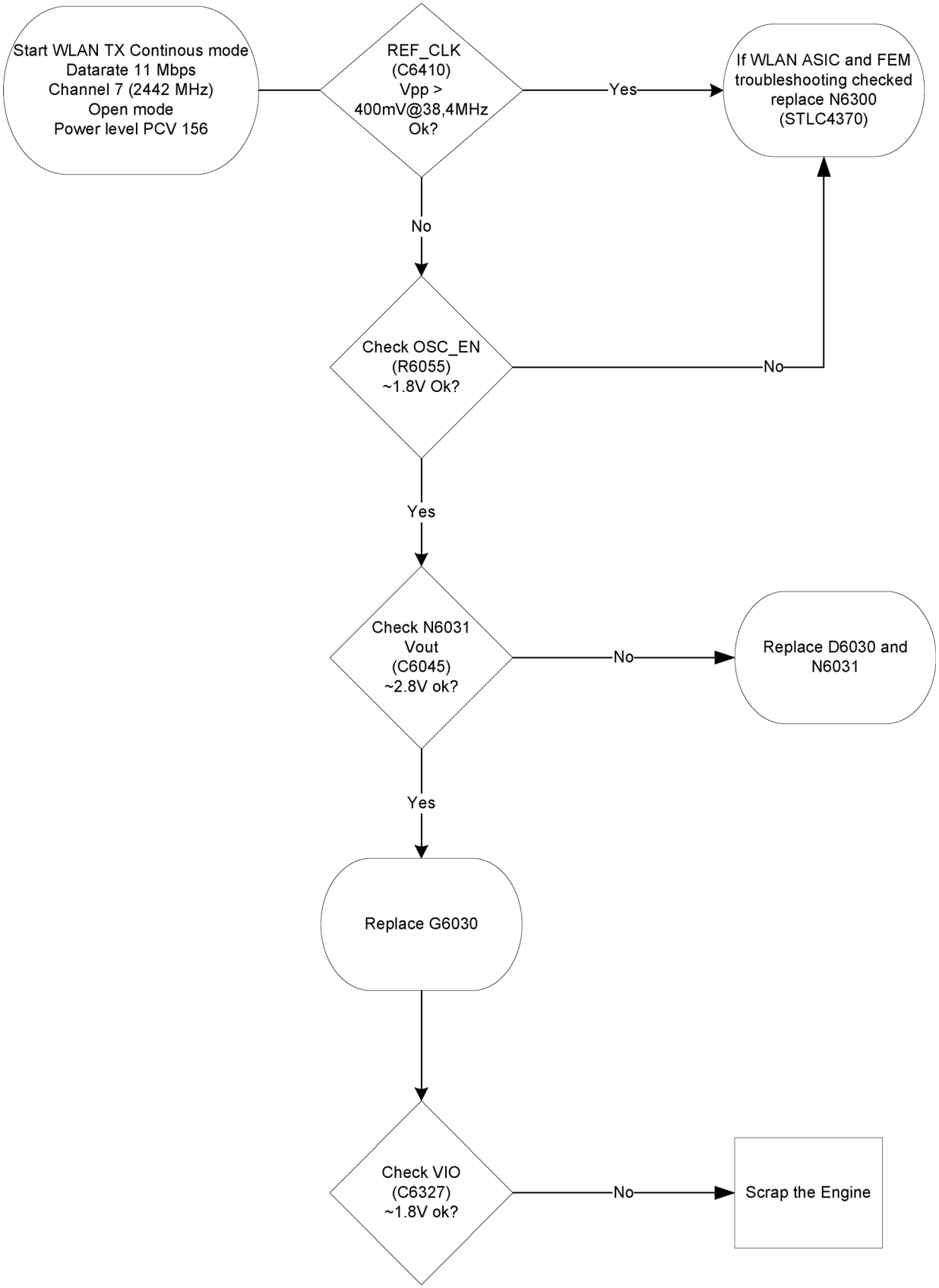

Figure 60 WLAN / BT TCXO troubleshooting

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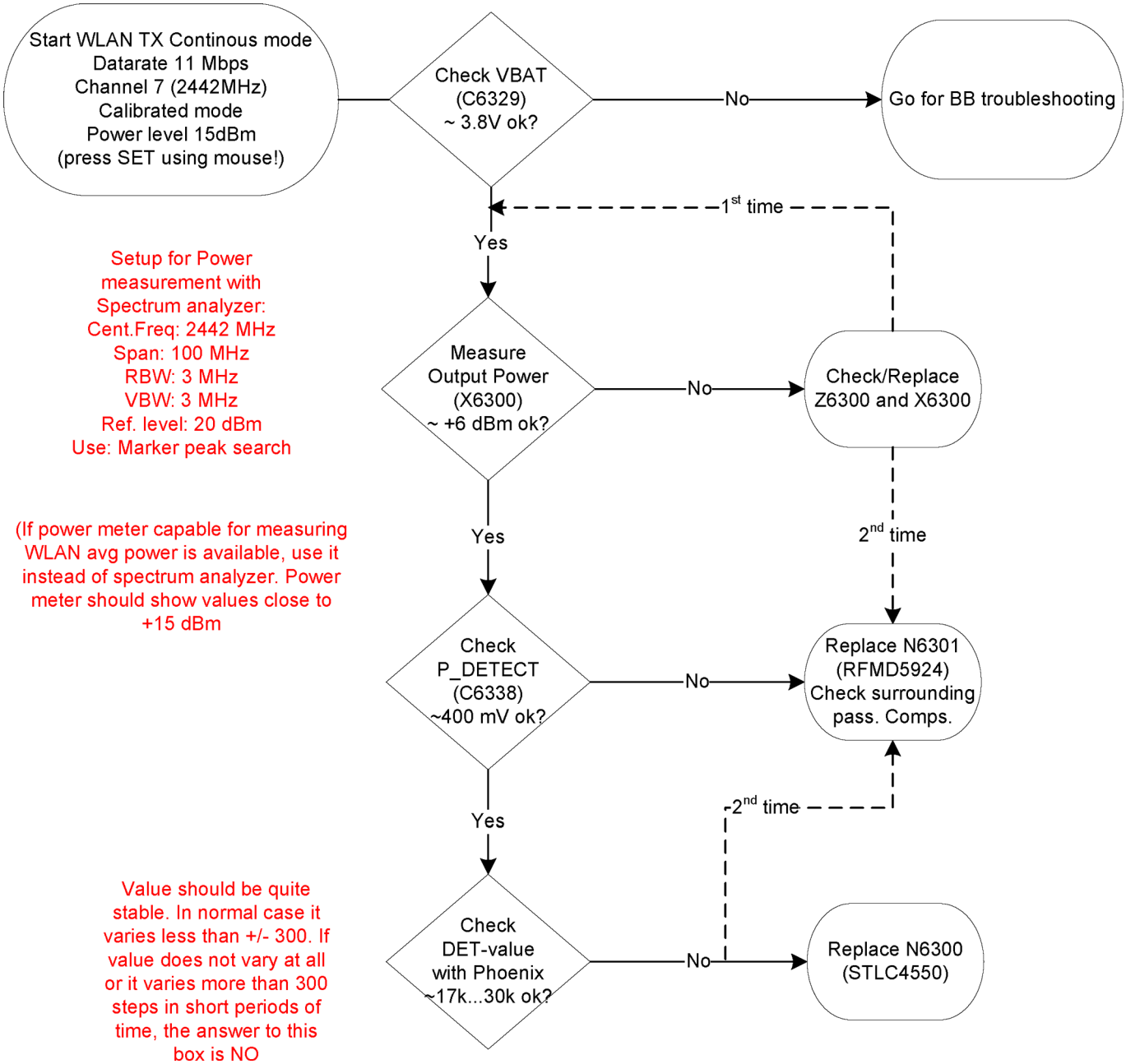

Figure 61 WLAN FEM troubleshooting

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8 — Camera Module Troubleshooting

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Introduction to camera module troubleshooting

Background, tools and terminology

Faults or complaints in camera operation can be roughly categorised into three subgroups:

1 Camera is not functional at all; no image can be taken.

2 Images can be taken but there is nothing recognizable in them.

3 Images can be taken and they are recognizable but for some reason the quality of images is seriously degraded.

Image quality is very hard to measure quantitatively, and even comparative measurements are difficult (comparing two images) to do, if the difference is small. Especially if the user is not satisfied with his/her device's image quality, and tells, for example, that the images are not sharp, it is fairly difficult to accurately test the device and get an exact figure which would tell whether the device is functioning properly.

Often subjective evaluation has to be used for finding out if a certain property of the camera is acceptable or not. Some training or experience of a correctly operating reference device may be needed in order to detect what actually is wrong.

It is easy for the user to take bad images in bad conditions. Therefore the camera operation has to be checked always in constant conditions (lighting, temperature) or by using a second, known-to-be good device as reference.

When checking for possible errors in camera functionality, knowing what error is suspected significantly helps the testing by narrowing down the amount of test cases. The following types of image quality problems may be expected to appear:

- Dust (black spots)
- Lack of sharpness
- Bit errors

Terms

Dynamic range	Camera's ability to capture details in dark and bright areas of the scene simultaneously.
Exposure time	Camera modules use silicon sensor to collect light and for forming an image. The imaging process roughly corresponds to traditional film photography, in which exposure time means the time during which the film is exposed to light coming through optics. Increasing the time will allow for more light hitting the film and thus results in brighter image. The operation principle is exactly the same with silicon sensor, but the shutter functionality is handled electronically i.e. there is no mechanical moving parts like in film cameras.
Flicker	Phenomenon, which is caused by pulsating in scene lighting, typically appearing as wide horizontal stripes in an image.
Noise	Variation of response between pixels with same level of input illumination.
Resolution	Usually the amount of pixels in the camera sensor; for example, this product has a 1600 x 1200 pixel sensor resolution. In some occasions the term resolution is used for describing the sharpness of the images.

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Sensitivity	Camera module's sensitivity to light. In equivalent illumination conditions, a less sensitive camera needs a longer exposure time to gather enough light in forming a good image. Analogous to ISO speed in photographic film.
Sharpness	Good quality images are 'sharp' or 'crisp', meaning that image details are well visible in the picture. However, certain issues, such as non-idealities in optics, cause image blurring, making objects in picture to appear 'soft'. Each camera type typically has its own level of performance.

The effect of image taking conditions on image quality

There are some factors, which may cause poor image quality, if not taken into account by the end user when shooting images, and thus may result in complaints. The items listed are normal to camera operation and are not a reason for changing the camera module.

Distance to target

The lens in the module is specified to operate satisfactorily from 40 cm to infinite distance of scene objects. In practice, the operation is such that close objects may be noticed to get more blurred when distance to them is shorter than 40 cm. The lack of sharpness is first visible in full resolution (1280 x 1024) images. If observing just the viewfinder, even very close objects may seem to appear sharp. This is normal; do not change the camera module.

Figure 62 Blurred image. Target too close.

The amount of light available

In dim conditions camera runs out of sensitivity. The exposure time is long (especially in the night mode) and the risk of getting shaken (= blurred) images increases. In addition, image noise level grows. The maximum exposure time in the night mode is ¼ seconds. Therefore, images need to be taken with extreme care and by supporting the phone when the amount of light reflected from the target is low. Because of the longer exposure time and larger gain value, noise level increases in low light conditions. Sometimes blurring may even occur in daytime, if the image is taken very carelessly. See the figure below for an example. This is normal; do not change the camera module.

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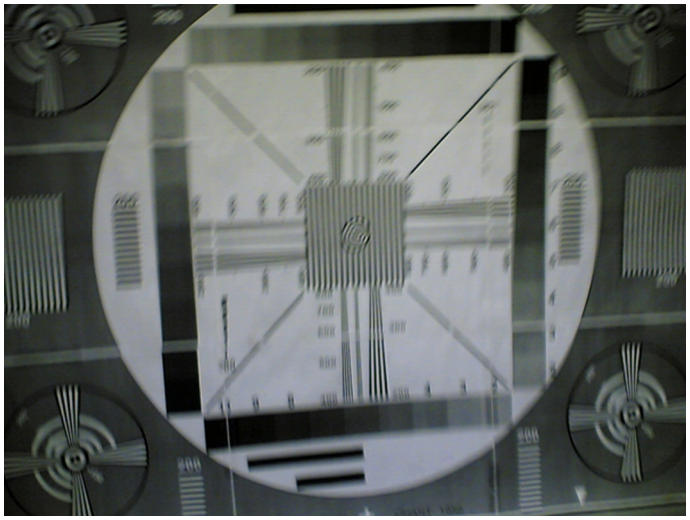

Figure 63 Blurring caused by shaking hands

Movement in bright light

If an image is taken of moving objects or if the device is used in a moving vehicle, object 'skewing' or 'tilting' may occur. This phenomenon is fundamental to most CMOS camera types, and usually cannot be avoided. The movement of camera or object sometimes cause blurring indoors or in dim lighting conditions because of long exposure time. This is normal; do not change the camera module.

Figure 64 Near objects get skewed when taking images from a moving vehicle

Temperature

High temperatures inside the mobile phone cause more noise to appear in images. For example, in +70 degrees (Celsius), the noise level may be very high, and it further grows if the conditions are dim. If the phone processor has been heavily loaded for a long time before taking an image, the phone might have considerably higher temperature inside than in the surrounding environment. This is also normal to camera operation; do not change the camera module.

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Figure 65 Noisy image taken in +70 degrees Celsius

Phone display

If the display contrast is set too dark, the image quality degrades: the images may be very dark depending on the setting. If the display contrast is set too bright, image contrast appears bad and "faint". This problem is solved by setting the display contrast correctly. This is normal behaviour; do not change the camera module.

Basic rules of photography (especially shooting against light)

Because of dynamic range limitations, taking images against bright light might cause either saturated image or the actual target appear too dark. In practice, this means that when taking an image indoors and having, for example, a window behind the object, the result is usually poor. This is normal behaviour; do not change the camera module.

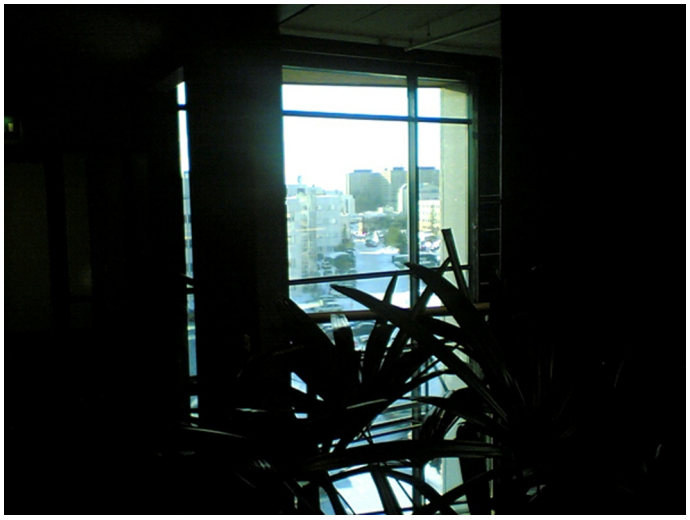

Figure 66 Image taken against light

Flicker

In some occasions a bright fluorescent light may cause flicker in the viewfinder and captured image. This phenomenon may also be a result, if images are taken indoors under the mismatch of 50/60 Hz electricity network frequency. The electricity frequency used is automatically detected by the camera module. In some very few countries, both 50 and 60 Hz networks are present and thus probability for the phenomenon increases. Flickering occurs also under high artificial illumination level. This is normal behaviour; do not change the camera module.

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Figure 67 Flicker in an image; object illuminated by strong fluorescent light

Bright light outside of image view

Especially the sun can cause clearly visible lens glare phenomenon and poor contrast in images. This happens because of undesired reflections inside the camera optics. Generally this kind of reflections are common in all optical systems. This is normal behaviour; do not change the camera module.

Figure 68 A lens reflection effect caused by sunshine

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Examples of good quality images

Figure 69 Good image taken indoors

Figure 70 Good image taken outdoors

Camera construction

This section describes the mechanical construction of the camera module for getting a better understanding of the actual mechanical structure of the module.

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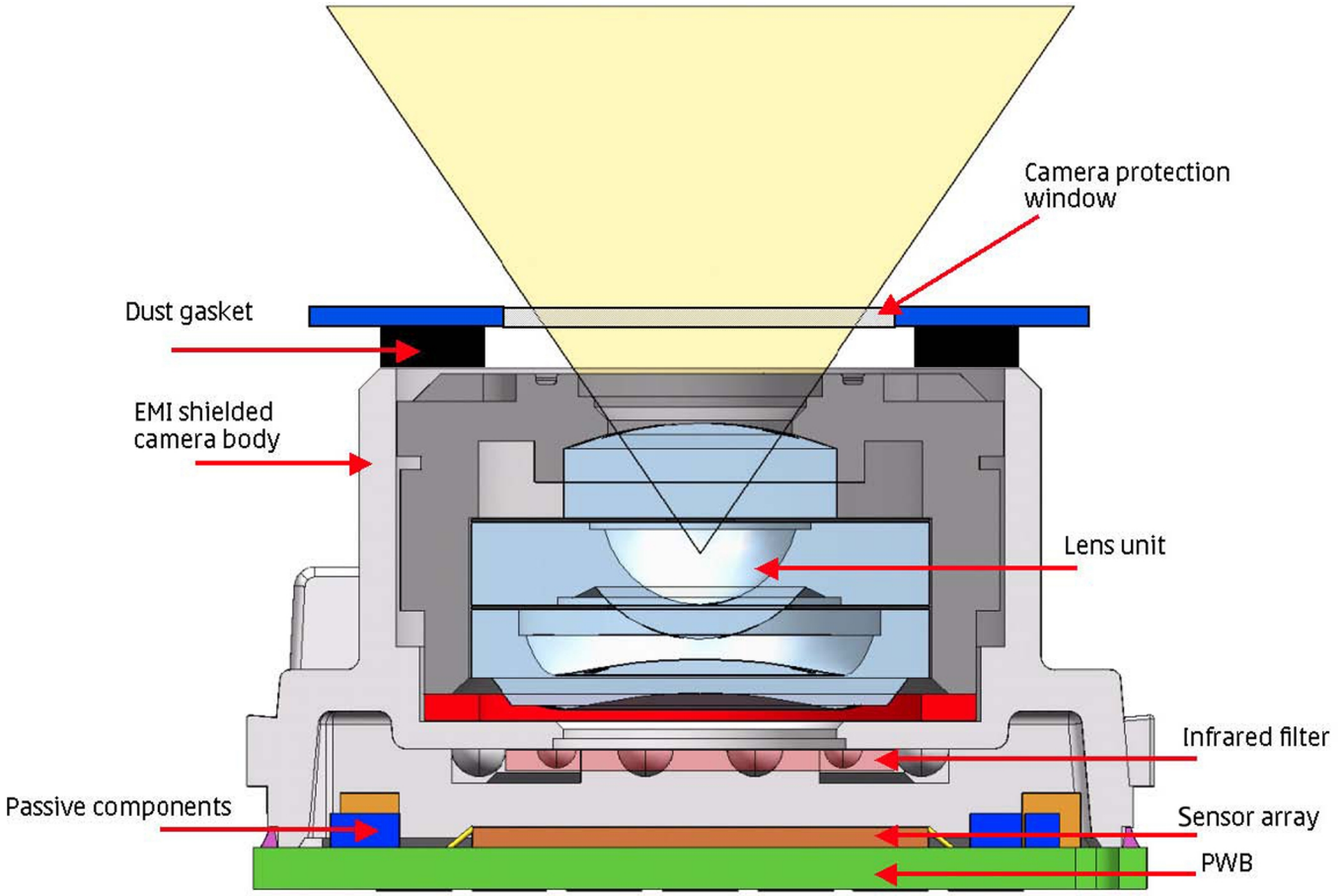

Figure 71 Camera module cross section and assembly principle

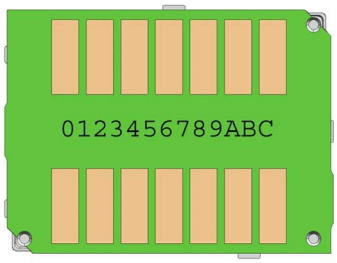

Figure 72 Camera module bottom view including serial numbering

The camera module as a component is not a repairable part, meaning that the components inside the module may not be changed. Cleaning dust from the front face is allowed only. Use clean compressed air.

The camera module uses socket type connecting. For versioning, laser marked serial numbering is used on the PWB.

The main parts of the module are:

- Lens unit including lens aperture.
- Infrared filter; used to prevent infrared light from contaminating the image colors. The IR filter is glued to the EMI shielded camera body.
- Camera body; made of conductive metallized plastic and attached to the PWB with glue.
- Sensor array including DSP functions is glued and wire-bonded to the PWB.
- PWB, FR-4 type
- Socket type connection

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- Laser-marked serial numbering on PWB (for versioning)
- Passive components
- Camera protection window; part of the phone cover mechanics
- Dust gasket between the lens unit and camera protection window

Image quality analysis

Testing for dust in camera module

Symptoms and diagnosis

For detecting dust problems, take an image of a uniform white surface and analyse it in full resolution. A good quality PC CRT monitor is preferred for analysis (avoid using LCD). Search carefully because finding these defects is not always easy. Figure "Effects of dust on optical path" is an example of an image having easily detectable dust problems.

When taking a white image, use uniformly lightened white paper or white wall. Another option is to use uniform light but in this case make sure that the camera image is not flickering when taking the test image. In case flickering occurs, try to reduce the illumination level. Use JPEG image format for analysing, and set the image quality parameter to ‘High Quality’.

Black spots in an image are caused by dirt particles trapped inside the optical system. Clearly visible and sharp edged black dots in an image are typically dust particles on the image sensor. These spots are searched for in the manufacturing phase, but it is possible that the camera body cavity contains a particle, which may move onto the image sensor active surface, for example, when the phone is dropped. Therefore it is also possible that the problem will disappear before the phone is brought to service. The camera should be replaced if the problem is present when the service technician analyses the phone.

If dust particles are lying on the infrared filter surface on either side, they are hard to locate because they are out of focus, and appear in the image as large, grayish and fading-edge 'blobs'. Sometimes they are invisible to the eye, and the user probably does not notice them at all. However, it is possible that a larger particle disturbs the user, causing need for service.

Figure 73 Effects of dust on optical path

If large dust particles get trapped on top of the lens surface in the cavity between the camera window and the lens, they will cause image blurring and poor contrast. If dust stays on the camera module surface, camera cussion, camera bezel or window at assembling, dust may sneak into the optical system as the optical zoom or Auto focus lens moves back and forth. The camera cussion and bezel between the window and the lens unit or camera module should prevent any particles from getting into the cavity after the manufacturing phase.

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If dust particles are found on the sensor, this is classified as a manufacturing error of the module, and the camera should be replaced. Any particles inside the cavity between the protection window and the lens have most probably been trapped there in the assembly phase at a Nokia factory. Unauthorized disassembling of the product can also be the root of the problem. However, in most cases it should be possible to remove the particle(s) by using clean compressed air. Never wipe the lens surface before trying compressed air; the possibility of damaging the lens is substantial. Always check the image sharpness after removing dust.

Testing camera image sharpness

Symptoms and diagnosis

If pictures taken with a device are claimed to be blurry, there are six possible sources for the problem:

1 The protection window is fingerprinted, soiled, dirty, visibly scratched or broken.

2 The photographed object is too close – the camera lens operates with distances from 40 cm to infinity. This is no cause to replace camera module.

3 User has tried to take pictures in too dark conditions, and images are blurred due to handshake or movement. This is no cause to replace camera module.

4 There is dirt between the protection window and camera lens.

5 The protection window is defective. This can be either a manufacturing failure or caused by the user. The window should be changed.

6 The camera lens is misfocused because of a manufacturing error.

A quantitative analysis of sharpness is very difficult to conduct in any other environment than optics laboratory. Therefore, subjective analysis should be used.

If no visible defects (items 1-4) are found, a couple of test images should be taken. Generally, a well-illuminated typical indoor scene can be used as a target. The main considerations are:

- The protection window has to be clean.
- The amount of light (300 – 600 lux (bright office lighting)) is sufficient.
- The scene should contain, for example, small objects for checking sharpness. Their distance should be 1 – 2 meters.
- If possible, compare the image to another image of the same scene, taken with a different device. Note that the reference device has to be a similar Nokia phone.

Steps

1. Take several images of small objects in the distance of 1-2 metres.
2. Analyse the images on a PC screen at 100% scaling with the reference images.

   Pay attention to the computer display settings: at least 65000 colors (16-bit) have to be used. True colour (24-bit, 16 million colours) or 32-bit (full colour) setting is recommended.

Next actions

If there appears to be a clearly noticeable difference between the reference image and the test images, the module might have a misfocused lens -> change the module.

Re-check the resolution after changing the camera module.

If the changed module produces the same result, the fault is probably in the camera window. Check the window by looking carefully through it when replacing the module.

Dirty camera lens protection window

The following series of images demonstrates the effects of fingerprints on the camera protection window.

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It should be noted that the effects of any dirt in images can vary much. It may be difficult to judge whether the window has been dirty or if something else is wrong. Therefore, the cleanness of the protection window should always be checked and the window should be wiped clean with a suitable cloth.

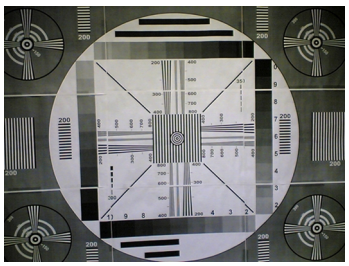

Figure 74 Image taken with clean protection window

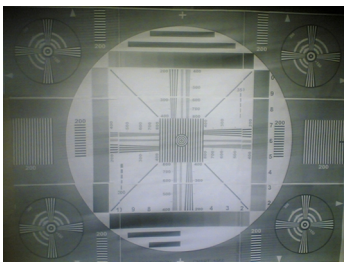

Figure 75 Image taken with greasy protection window

Image bit errors

Bit errors are image defects caused by data transmission errors between the camera module and the phone baseband and/or errors inside the module.

Usually bit errors can be easily detected in images, and they are best visible in full resolution images. A good practice is to use a uniform white test target when analysing these errors. The errors are clearly visible, colourful sharp dots or lines in camera images. See the following figure.

Figure 76 Bit errors caused by JPEG compression

One type of bit error is a lack of bit depth. In this case, the image is almost totally black under normal conditions, and only senses something in very highly illuminated environments. Typically this is a contact problem between the camera module and the phone main PWB. You should check the camera assembly and connector contacts.

If the fault is in the camera module, bit errors are typically visible only when using some specific image resolution. For example, in case of a viewfinder fault, the error might exist but is not visible in a full size image.

> **Note:** At the most 5 clusters of black dots or blemish are not considered errors, and no reason to replace camera module

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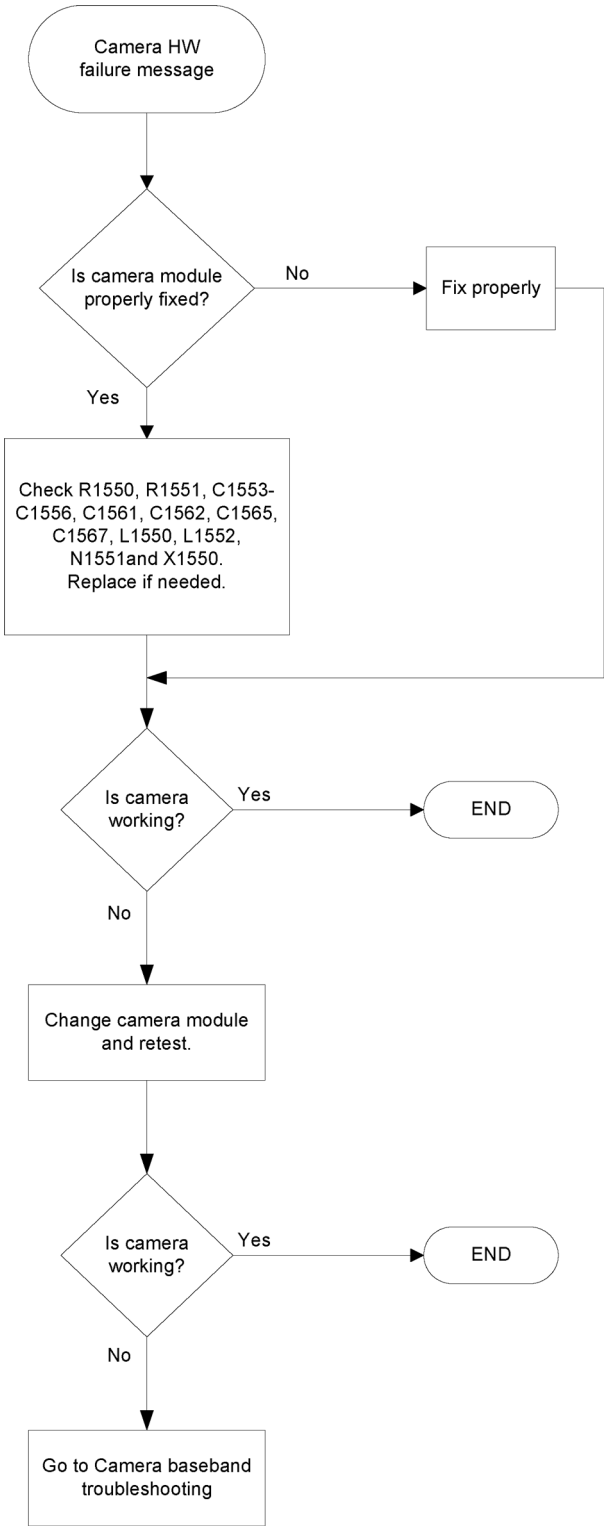
Camera troubleshooting flowcharts

Camera hardware failure message troubleshooting

Troubleshooting flow



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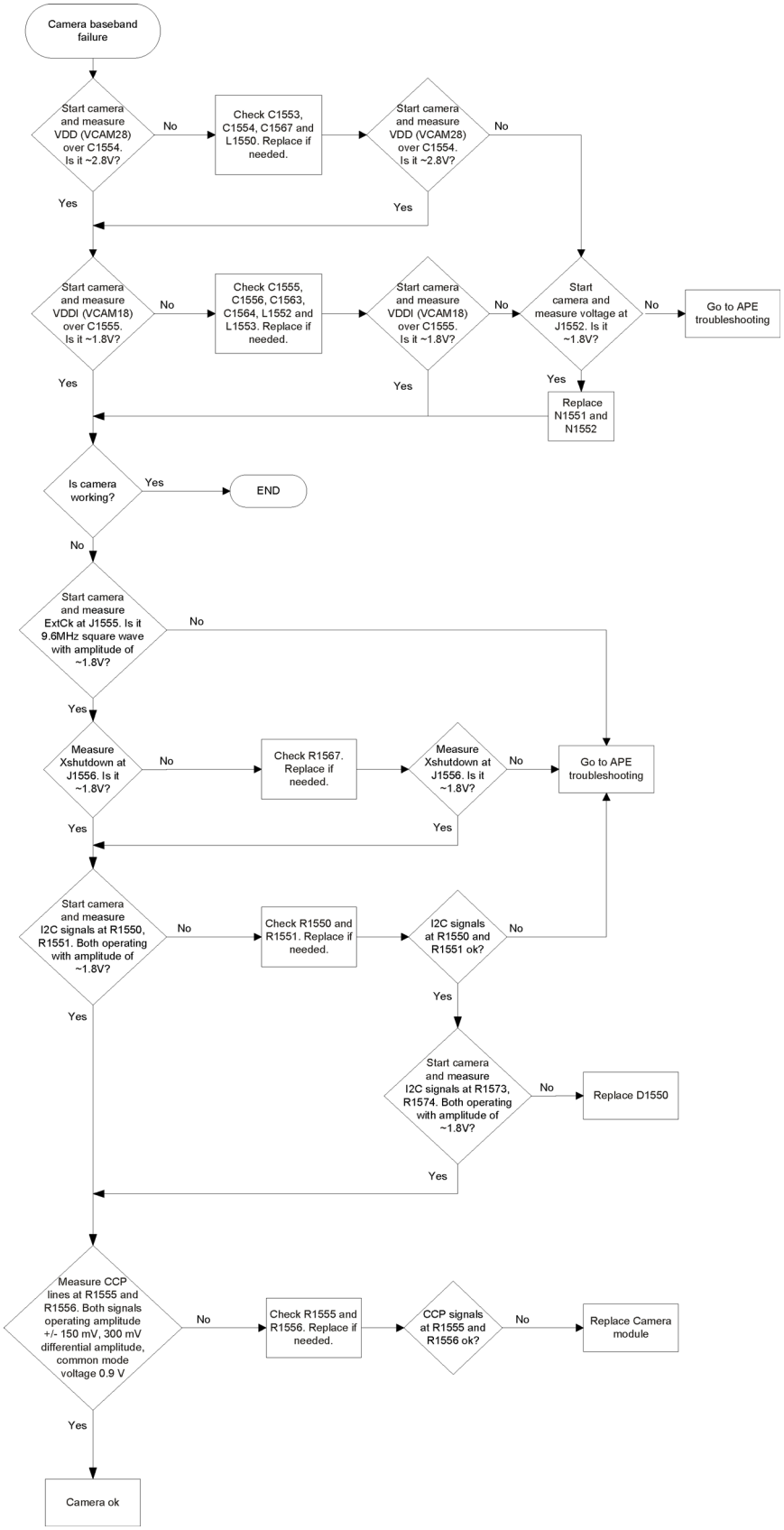
Camera baseband hardware troubleshooting

Troubleshooting flow



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9 — System Module

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Baseband description

System module block diagram

Note: In this description, user interface HW covers display, keyboard, keyboard backlight and ALS.

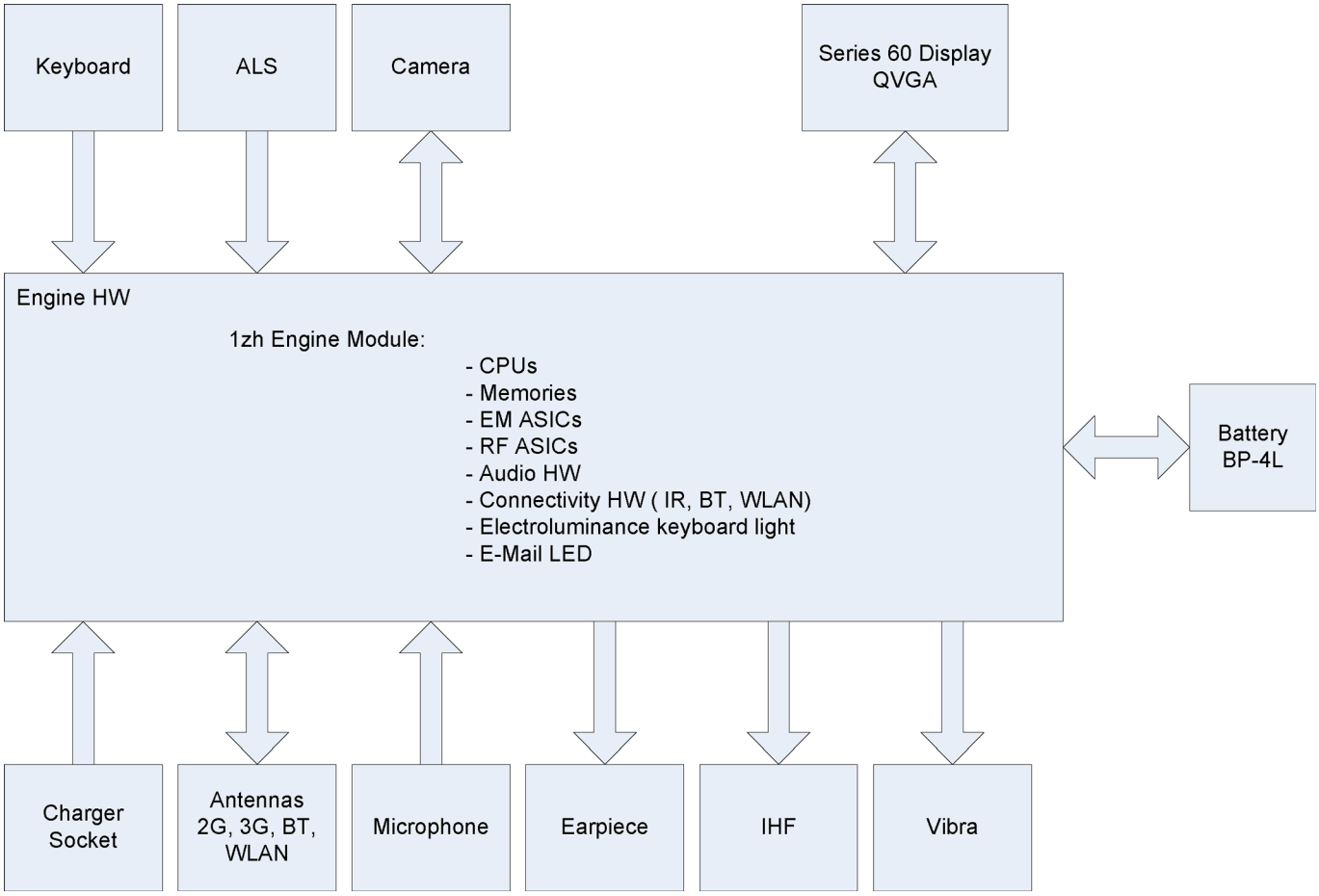

Figure 77 System level block diagram

Baseband functional description

Digital baseband consists of ISA based modem and SYMBIAN based application sections. Modem functionality is in RAP3GS and Helen3 acts as a platform for SYMBIAN applications.

Modem section consists of RAP3GS ASIC with NOR FLASH and DDRAM memory as the core. Memory package POP2 is stacked on to RAP3GS. RAP3GS supports cellular protocols of WCDMA (3GPP R-4) and GSM (minimum EDGE glass 10, GPRS phase2). Modem DDRAM memory have 128Mbits of memory and NOR flash have 128Mbits of memory. RAP3G operates with the system clock of 38.4 MHz, which comes from the VCTCXO.

Application section includes Helen3 ASIC with DDR/NAND combo memory as the core. Stacked DDR/NAND application memory has 512Mbits of DDR memory and 1024Mbits of NAND flash memory. Helen3 uses 19.2MHz clock, which comes from the RAP3GS divided by two from the 38.4 MHz system clock.

Helen3 processor (OMAP1710) is also called as an application ASIC because it is processing application SW and handles the UI SW. It consists of OMAP3.3 and peripheral subsystems like display- and keyboard driver blocks.

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Absolute maximum ratings

Signal	Min	Nom	Max	Unit	Notes
Battery voltage (idle)	-0.3		+4.5	V	Battery voltage maximum value is specified during charging is active
Battery voltage (Call)	+3.2		+4.3	V	Battery voltage maximum value is specified during charging is active
Charger input voltage	-0.3		+20	V	
Back-Up supply voltage	0	2.5	2.6	V	Maximum capacity of the backup power supply assumed to be 10 µAh.

Phone modes of operation

Mode	Description
NO_SUPPLY	(dead) mode means that the main battery is not present or its voltage is too low (below VILMA master reset threshold) and that the back-up battery voltage is too low.
BACK_UP	The main battery is not present or its voltage is too low but back-up battery voltage is adequate and the 32kHz oscillator is running (RTC is on).
PWR_OFF	In this mode (warm), the main battery is present and its voltage is over VILMA master reset threshold. All regulators are disabled, PurX is on low state, the RTC is on and the oscillator are off.
RESET	RESET mode is a synonym for start-up sequence. RESET mode uses 32kHz clock to count the REST mode delay (typically 16ms).
SLEEP	SLEEP mode is entered only from PWR_ON mode with the aid of SW when the systems activity is low. There are in principle three different sleep modes: • Helen3 sleep • RAP3GS sleep • Helen3 and RAP3GS sleep (deep sleep)
FLASHING	FLASHING mode is for SW downloading.

Voltage limits

Parameter	Description	Value
VMSTR	Master reset threshold (N2200)	2.2V (typ.)
VMSTR+	Threshold for charging, rising (N2300)	2.1V (typ.)

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Parameter	Description	Value
VMSTR-	Threshold for charging, falling (N2300)	1.9V (typ.)
VCOFF+	Hardware cutoff (rising)	2.9V (typ.)
VCOFF-	Hardware cutoff (falling)	2.6V (typ.)
SWCOFF	SW cutoff limit	~3.2V

The master reset threshold controls the internal reset of N2200 / (N2300). If battery voltage is above VMSTR, N2300's charging control logic is alive. Also, RTC is active and supplied from the main battery. Above VMSTR, N2300 allows the system to be powered on although this may not succeed due to voltage drops during start up. SW can also consider battery voltage too low for operation and power down the system.

Power key

The system boots up when power key is pressed (adequate battery voltage, VBAT, present).

Power down can be initiated by pressing the power key again (the system is powered down with the aid of SW). Power on key is connected to N2200 ASIC via PWRONX signal.

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Power distribution

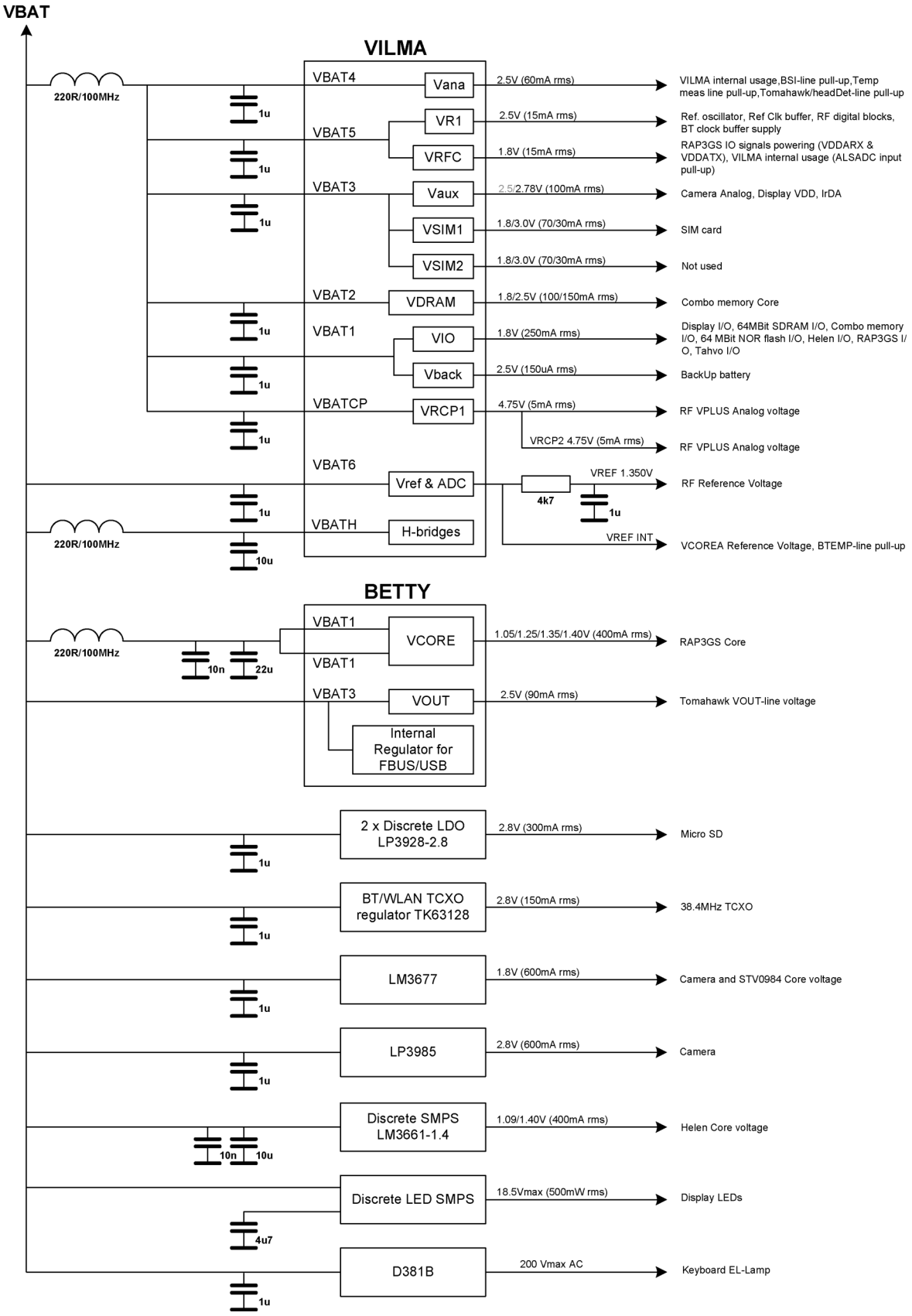

Figure 78 Power distribution diagram

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Power supply components:

- VILMA
- BETTY
- Helen VCORE SMPS
- BT
- LDO
- backlight SMPS
- EL-driver
- MicroSD level shifters

All the above are powered by the main battery voltage.

Battery voltage is also used on the RF side for power amplifiers (GSM PA & WCDMA PA) and for RF ASIC PIHI.

Discrete power supplies are used to generate 2.8V to BT, 1.3V/1.5V for Helen 3 and 18V for the backlight LEDs.

The device supports both 1.8V/3V SIM cards which are powered by VILMA / VSIM1. Level shifters are used to power MicroSD. USB accessories which need power from the device are powered by BETTY / VOUT.

Because LED driver in BETTY is not used, the external SMPS is used instead. External LED SMPS is still controlled by BETTY PWM300 and powered by battery voltage.

System power-up

After inserting the main battery, regulators started by HW are enabled. SW checks, if there is some reason to keep the power on. If not, the system is set to power off state by watchdog. Power up can be caused by the following reasons:

- T0: Power key is pressed
- Charger is connected
- RTC alarm occurs
- MBUS wake-up

Clocking scheme

There are two main clocks in the system: a 38.4 MHz RF clock produced by VCTCXO in the RF section, and a 32.768 kHz sleep clock produced by EM ASIC N2200 with an external crystal.

The RF clock is generated only when VCTCXO is powered on by an N2200 regulator. The regulator itself is activated by SleepX signals from both RAP and the application processor. When both CPUs are on sleep, the RF clock is stopped.

The RF clock is used by RAP that then provides (divided) 19.2 MHz SysClk further to the application processor. Both RAP and the application processor have internal PLLs, which then create clock signals for other peripheral devices/interfaces like memory card, SIM, CCP, I2C and memories.

32k Sleep Clock is always powered on after startup. Sleep clock is used by RAP and the application processor for low-power operation.

SMPS Clk is a 2.4 MHz clock line from RAP to EM ASIC N2300 used for switch mode regulator synchronizing in the active mode. In the deep sleep mode, when VCTCXO is off, this signal is set to '0'-state.

BT Clk is a 38.4 MHz signal from a different BT/WLAN VCTCXO G6030 to the Bluetooth system.

CLK600 is a 600 kHz signal from N2300 to APE VCORE SMPS. The clock source is an internal RC oscillator in N2300 (during the power-up sequence) or RAP SMPS Clk divided by 4 after the power-up sequence.

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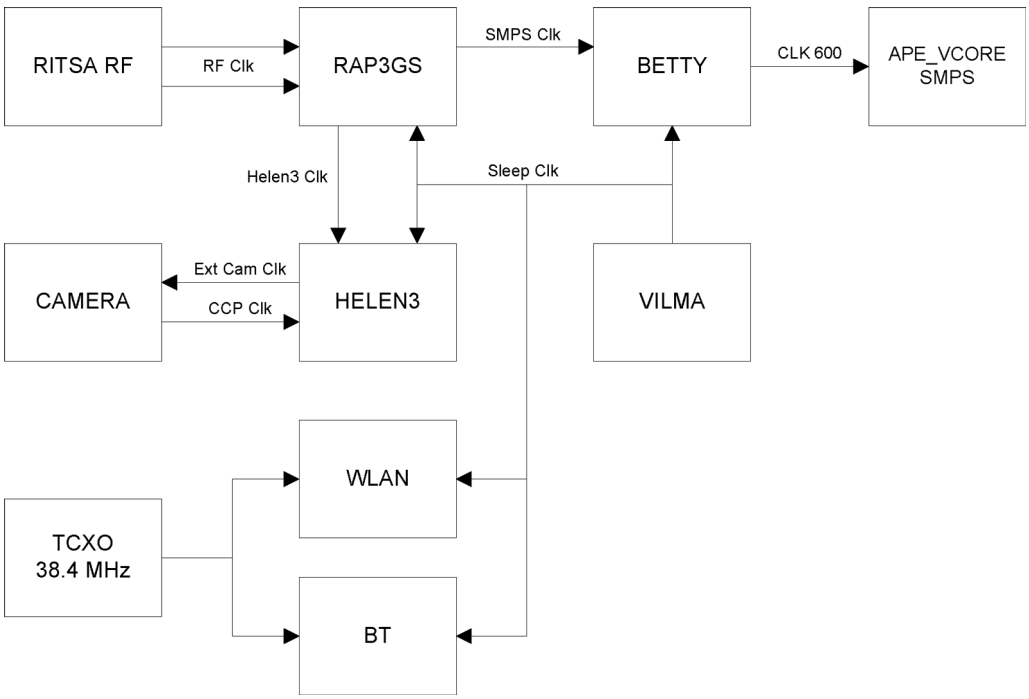

Figure 79 Clocking scheme

Bluetooth

Bluetooth provides a fully digital link for communication between a master unit and one or more slave units. The system provides a radio link that offers a high degree of flexibility to support various applications and product scenarios. Data and control interface for a low power RF module is provided. The data rate is regulated between the master and the slave.

The device Bluetooth is based on the BC3 BT ASIC.

The UART1 interface handles the transfer of control and data information between the application processor and the BT system.

The PCM interface is used for audio data transfer between RAP and the BT system.

IrDA

IrDA specifies a low-cost, reliable, fully digital peer-to-peer data link between IrDA units at data rates from 9600 bits/s to 115 kbit/s. The link is based on the serial transmission of data as pulses of infra red light at the wave length of 870nm and angles of +-15degrees at the range 0 - 50 to 100 cm. Because these restrictions and the optical nature of the link, the transmission is not omnidirectional but focused and only reaches a peer at a limited line-of-sight distance from the transmitter thus not disturbing any other units in the neighbourhood.

Baud rates in the range 9600 bit/s to 115 kbit/s are known as SIR (Slow IR); this data is sent asynchronously. The protocol and speed are only changed after successful negotiation. IrDA connectivity includes IrCOMM, IrOBEX, IrTran-P, IrMC and PhoNet.

IR communication is half-duplex e.g. the IR receiver sees its own transmission, and the IR interface is either transmitting or receiving, but not both at once. IrDa modules consume current when the IR detector is active and therefore modules have to be set to the shutdown mode (SD-mode).

USB

USB (Universal Serial Bus) provides a wired connectivity between a USB host PC and peripheral devices.

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USB is a differential serial bus for USB devices. USB controller supports USB specification revision 2.0 with full speed USB (12 Mbps). The device is connected to the USB host through the system connector. The USB bus is hot plugged capable, which means that USB devices may be plugged in/out at any time.

SIM interface

The device has one SIM (Subscriber Identification Module) interface. It is only accessible if battery is removed. The SIM interface consists of an internal interface between RAP and EM ASIC (N2200), and of an external interface between N2200 and SIM contacts. The main SIM interface functionality is in RAP while the EM ASIC takes care of power up/down, card detection, ATR (Answer To Reset) counting and level shifting.

The SIM IF is shown in the following figure:

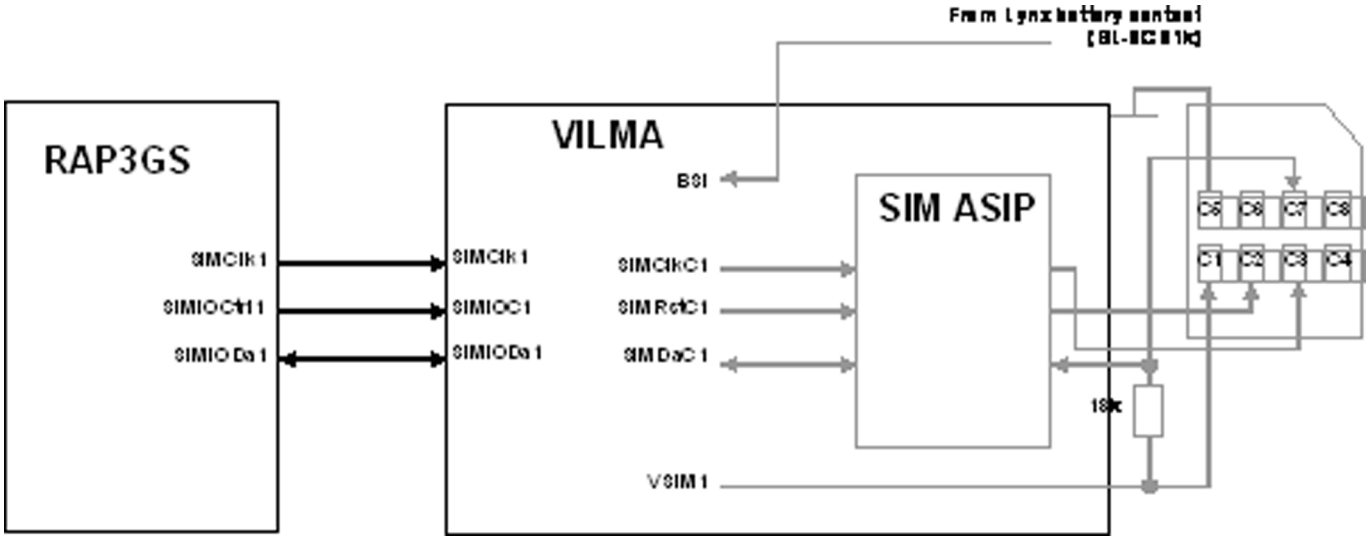

Figure 80 SIM interface

The EM ASIC handles the detection of the SIM card. The detection method is based in the BSI line. Because of the location of the SIM card, removing the battery causes a quick power down of the SIM IF.

The EM ASIC SIM1 interface supports both 1.8 V and 3.0 V SIM cards. The SIM interface voltage is first 1.8 V when the SIM card is inserted, and if the card does not response to the ATR a 3 V interface voltage is used.

The data communication between the card and the phone is asynchronous half duplex, and the clock supplied to the card is 1-5 MHz, which is 3.2 MHz by default (in GSM system). The data baud rate is the SIM card clock frequency divided by 372 (by default), 64, 32 or 16.

MicroSD interface

MicroSD interface

The microSD interface is compliant with The SD Memory Card Specification, Physical Layer Specification version 1.10. Clock frequencies over 24MHz are not supported. The SD memory card system defines two alternative communication protocols: SD and SPI. The card automatically detects the mode of the reset command and will expect all further communication to be in the same communication mode.

MicroSD interface connection is made with two LP3928 level shifter. MicroSD card is powered from level shifters.

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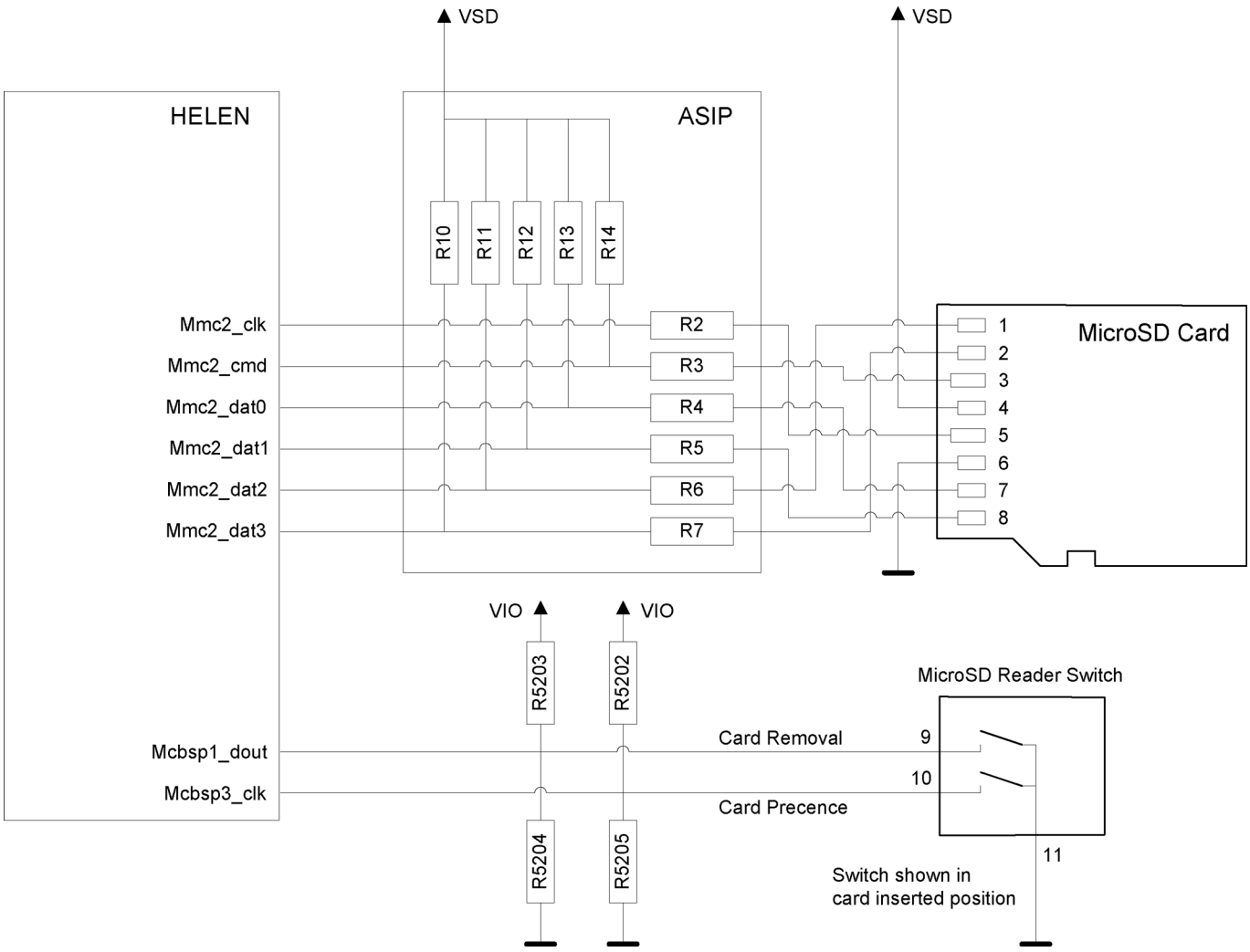

Figure 81 MicroSD interface

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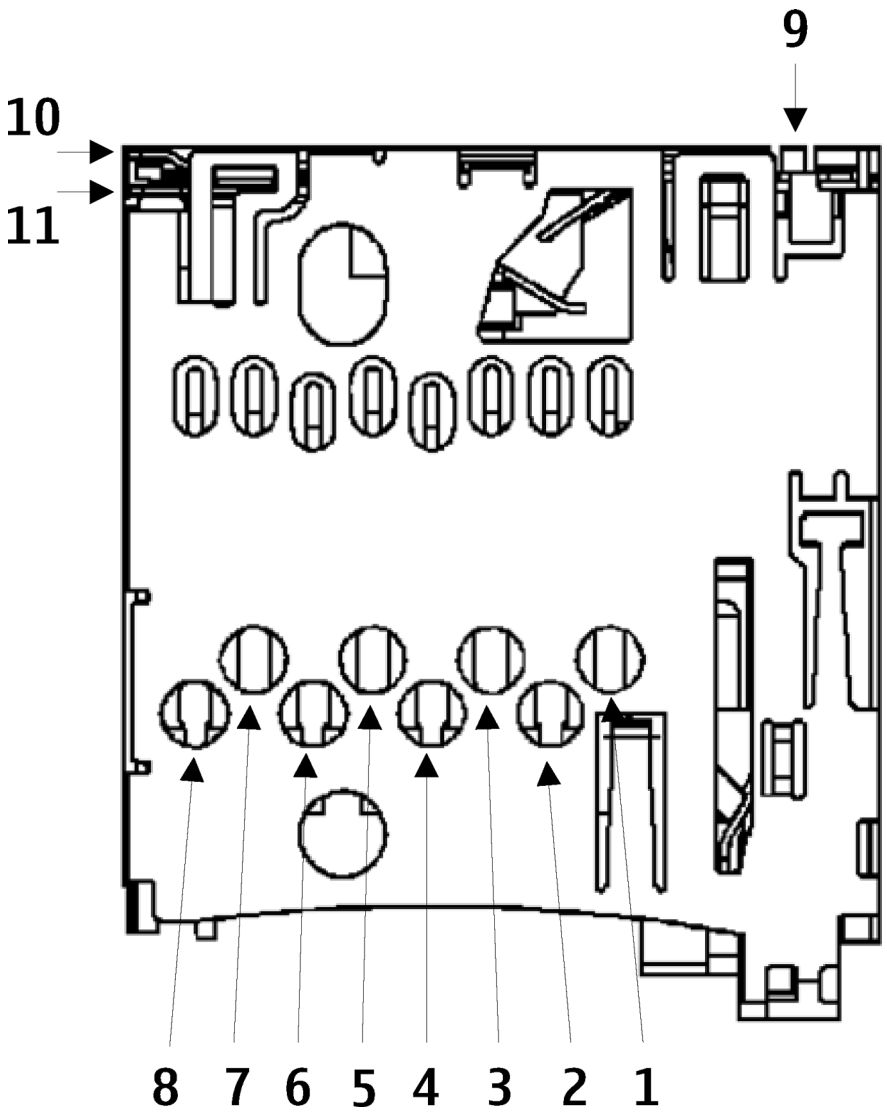

Figure 82 MicroSD contact area & pin order

Table 21

Pin	Signal	I/O	Engine Connection		Notes
1	Data2	<->	Helen 3	Mmc2_dat2	Data Line [bit 2]
2	Data3	<->	Helen 3	Mmc2_dat3	Data Line [bit 3]
3	CMD	<->	Helen 3	MMCcmd	Ground
4	Vdd	<-			3.0 V Regulator
5	CLK	<-	Helen 3	Mmc2_clk	External Clock for the MicroSD card
6	GND		GND		Ground
7	Data0	<->	Helen 3	Mmc2_dat0	Data Line [bit 0]
8	Data1	<->	Helen 3	Mmc2_dat1	Data Line [bit 1]
9	SW2	->	Helen 3	Mcbsp1_dout	Card removal Prewarning
10	SW1	->	Helen 3	Mcbsp3_clk	Card Precence

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Pin	Signal	I/O	Engine Connection		Notes
11	Vss		GND		Ground

Battery interface

The battery interface supports a 3-pole battery interface. The interface consists of three connectors: VBAT, BSI and GND.

The BSI line is used to recognize the battery capacity by a battery internal pull down resistor.

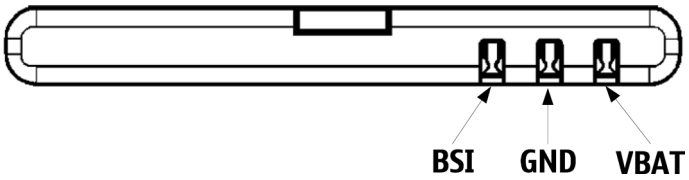

Figure 83 Battery pin order

Table 22 Battery interface connections

Pin	Signal	I/O	Engine connection		Notes
1	VBAT	->	EM ASIC N2200	VBAT	Battery voltage
2	BSI	->	EM ASIC N2200	BSI	Battery size indication (fixed resistor inside the battery pack)
3	GND		GND		Ground

Battery temperature is estimated by measuring separate battery temperature NTC via the BTEMP line, which is located on the transceiver PWB, at a place where the phone temperature is most stable.

For service purposes, the device SW can be forced into local mode by using pull down resistors connected to the BSI line.

Bluetooth RF

TI BRF 6150 ROM is a low power Bluetooth RF-tranceiver module meeting Bluetooth compatibility standards (Class 2 Bluetooth v1.2 compliant pre-qualified tranceiver system) and has the BTH/WLAN physical co-existence interface for Nokia application.

BRF 6150 is a single chip Bluetooth device appropriate for use in Nokia mobile phone applications, where the Nokia BB acts as a Bluetooth host interface.

Interface to RAP3G

The baseband uses RAP3G as the cellular ASIC and Helen3 as the Application processor.

This is because the BT application program runs on the Application processor in Symbian OS environment. Audio (PCM Interface) is still connected to the cellular ASIC such that cellular audio delay is kept minimum.

The Nokia BB and BRF 6150 interface can be logically divided into audio, user data and control Interfaces.

Audio interface

Audio data is transferred using a separate interface based on PCM (Sync, In, Out, Clk).

The interface is configured by MCU software but the data transfer is done by the DSP.

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Audio data is based on 8kHz sampling data – same as that used in the cellular system. The used configuration is as shown below:

Master/Slave	TI as Slave
Clock	Nokia BB ASIC generates PCM_CLK
Data width	16 bits PCM_out
Sync. Frame	Short PCM_Sync
Coding	PCM Linear

WLAN interface CXS

Coexistence Signaling Interface [CXS] between BTH and WLAN modules is to facilitate collocation in a terminal that has BTH and WLAN.

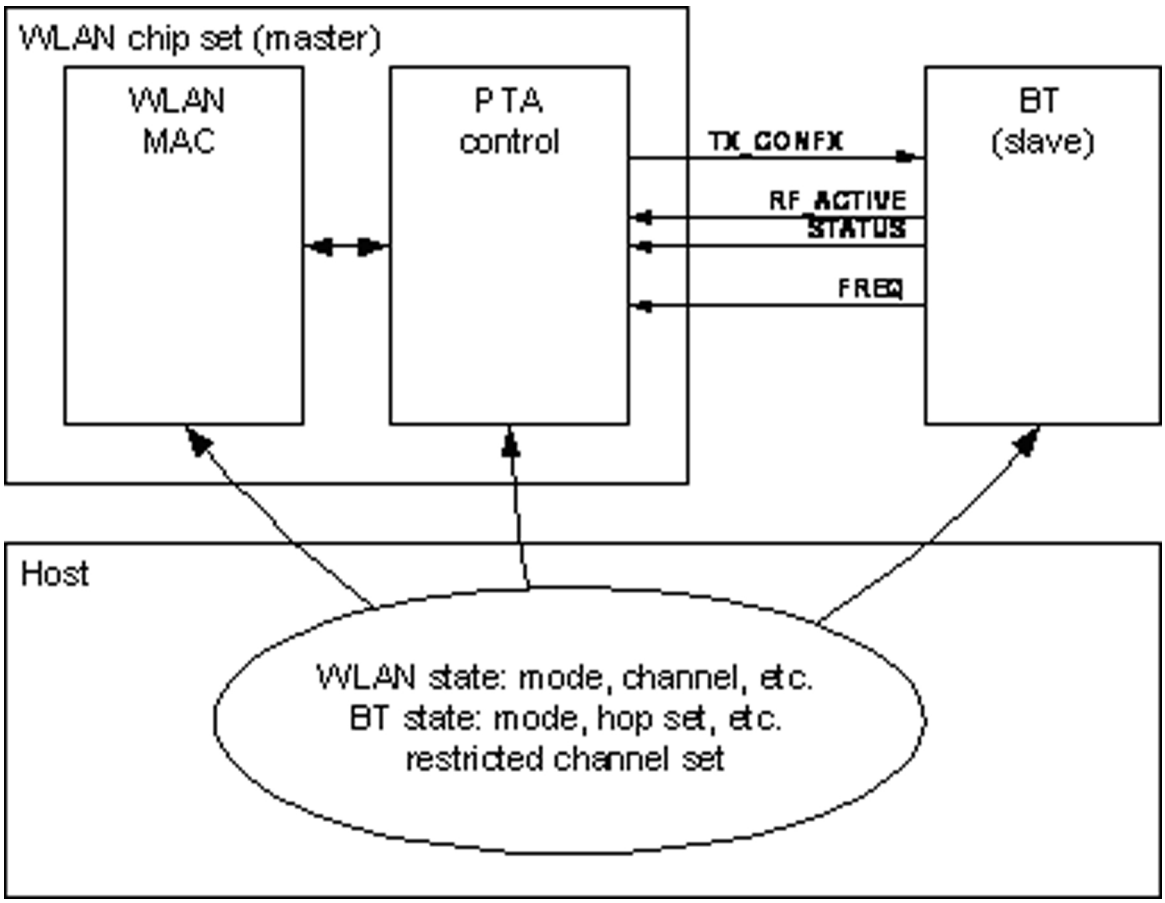

Figure 84 BT-WLAN coexistence framework

System partitioning

The interface between BRF 6150 and Nokia BB assumes that all higher layers above the HCI (host controller interface) are implemented in Nokia BB and all other layers (BB, Link Manager, Link Control, and component RF) below the HCI are implemented in BRF 6150.

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Clock signals

BRF 6150 requires a system clock, which it uses to derive all its internal timing. The clock may be sinusoidal or square and the frequency tolerance is +/-20 ppm. The external TCXO clock oscillator is used for the system clock with a sinusoidal output.

WLAN

STMicroelectronics STLC4370 implements 802.11b/g WLAN radio for embedded, low-power and small form factor mobile applications.

RFMD RF5924 Front-End Module (FEM) is a single integrated module. The FEM has integrated b/g power amplifier, power detector, RX balun and TX filtering.

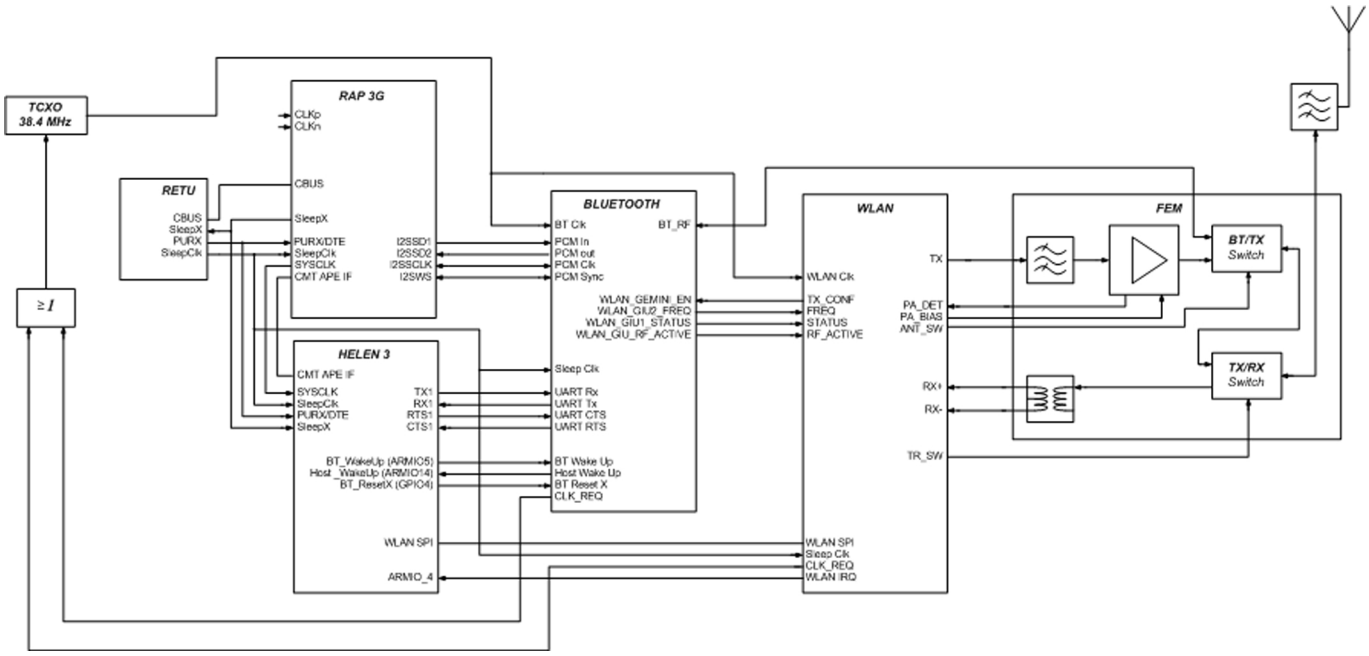

Figure 85 WLAN and BT block diagram

WLAN BB/MAC

The baseband chip implements OFDM/CCK digital baseband processor and ARM9-based MAC with internal SRAM memories.

Regulators

Switching stepdown regulator generates the MAC/BB digital core supply at 1.2 V.

Two separate LDOs at 1.8 V output supply the VCO and the transceiver. The main 1.8 V supply is used for transceiver analog parts, ADC/DAC and digital circuits inside the transceiver.

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User interface

Display interface

Display module mechanical concept

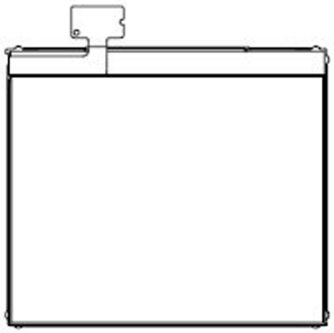

Figure 86 General diagram of the LCD module - front

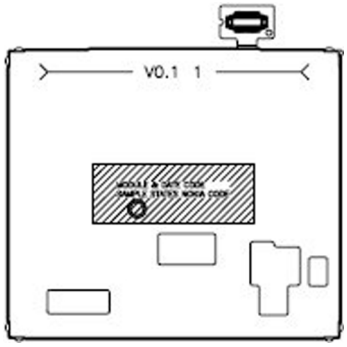

Figure 87 General diagram of the LCD module - back

Display features:

The display is a S60 display module, amorphous TFT active matrix color LCD It is capable of showing 16,777,216 colours. It incorporates a backlight system with 3 series by 2 parallel.

- Partial display function Power saving by pausing display process on part of the screen.
- Built-in RAM capacity 320rows x 240lines x 24bits = 184,320 bits

The display has two different operating modes:

1 Normal mode, Full screen, 16M colours

2 Partial mode, 8 colours but only part of the display is active

The interconnection between the LCD module and the Nokia engine is implemented with a 24-pin board-to-board connector.

Display is controlled via MeSSi-8 interface by Helen3. All MeSSi-8 signals go through the EMC filtering ASIPs.

The display module does not require any tunings in service.

Keyboard

The key matrix has seven rows and eight columns. Voice key, volume keys and joystick are connected to the same key matrix.

Display and keyboard backlight

The device has one LED Driver (SMPS) that is used to drive six display LEDs.

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Display LEDs are connected in to two three LED series. Current adjustment of the driver is done from the display LED branch, and keyboard current also depends on the display brightness. In a typical use case, keyboard LEDs are turned ON only in dark ambient lighting conditions.

The keyboard backlight is made with electroluminance. The device has discrete EL-driver, which provide backlight for keyboard.

Control signals for the LED driver are:

Table 23 LED driver control signals

	From	Voltage	Function
GenOut1	Betty	0V / 1.8V	EL ON (1.8V)/OFF (0V)
PWM	Betty	PWM 0%-100%, 1.8V	Current PWM control (16 steps)

ALS interface

Ambient Light Sensor (ALS) is located in the upper part of the phone. It consists of the following components:

- lightguide (part of the front cover)
- phototransistor (V4400) + resistor (R4401)
- NTC + resistors (R4400, R4402, R4403)
- EM ASIC (N2200)

Information on ambient lighting is used to control the backlights of the phone:

- Keypad lighting is switched on only when the environment is dark / dim
- Display backlights are dimmed, when the environment is dark / dim

The ambient light sensor itself is a photo transistor, which is temperature-compensated by an external NTC resistor. N2200 reads the light sensor (LS) and temperature (LST) results.

ALS calibration is not possible in the service points. ALS is serviced by replacing faulty phototransistors.

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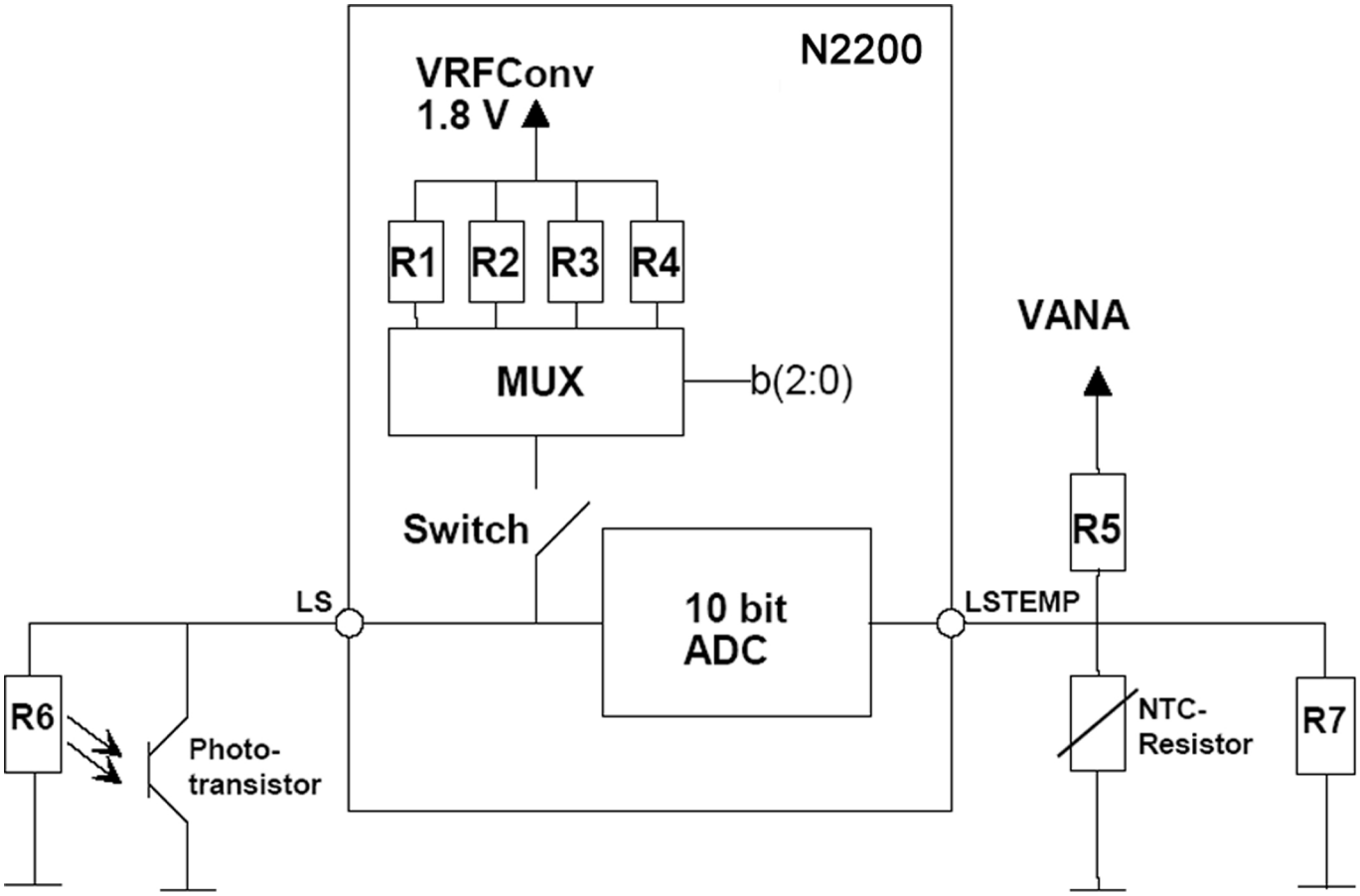

Figure 88 ALS HW implementation

Table 24 ALS resistor values

Symbol	R1	R2	R3	R4	R5	R6	R7	NTC-res
Value	5 kOhm	15 kOhm	30 kOhm	50 kOhm	470 kOhm	100 kohm	470 kohm	47 kOhm

E-Mail LED

The device has E-Mail indicator LED. The LED is connected Helen3 GPIO pin.

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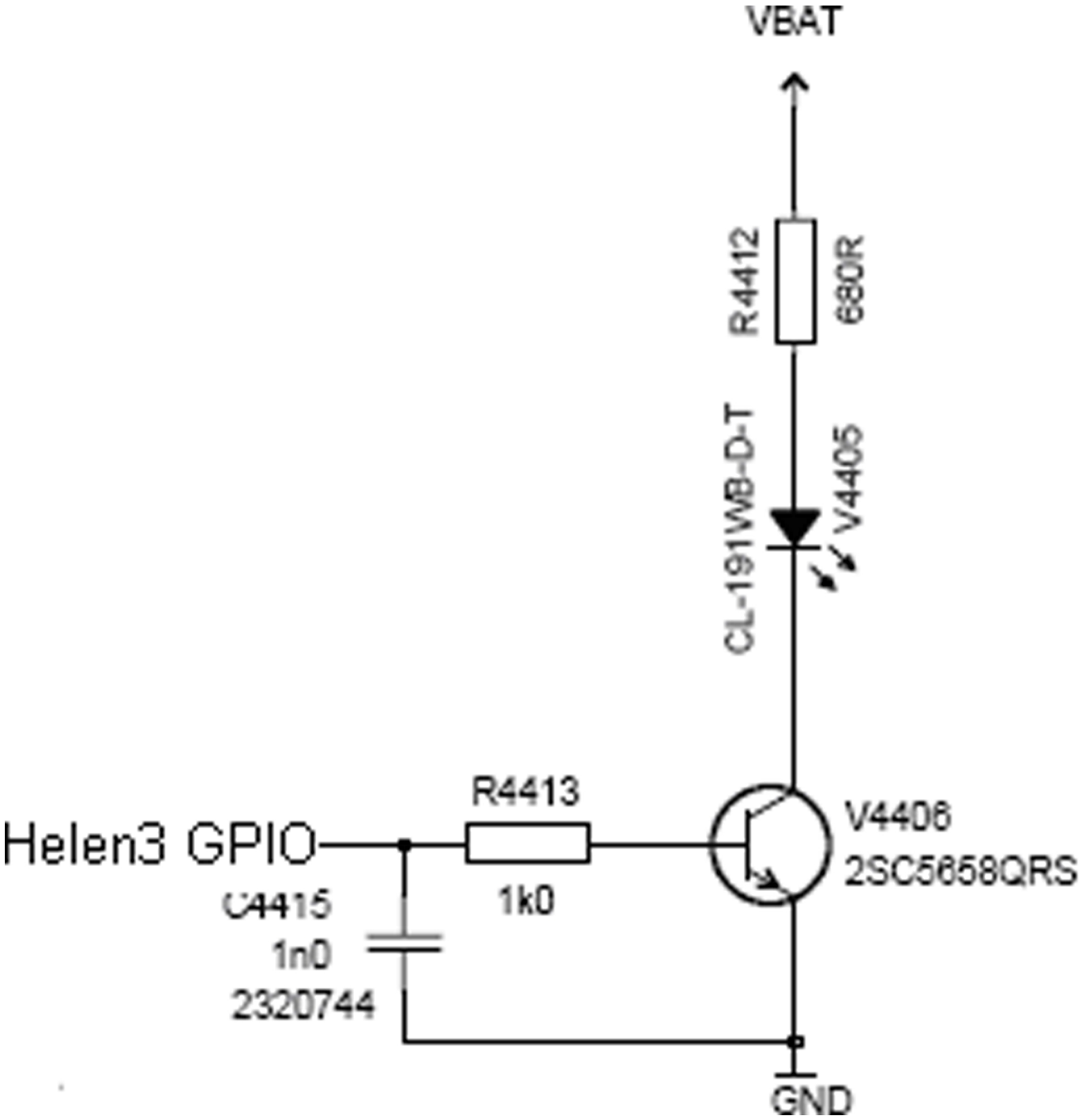

Figure 89 E-mail LED implementation

ASICs

RAP ASIC

RAP ASIC is a 3G Radio Application Processor. RAM memory is integrated into RAP.

EM ASIC N2200

The EM ASIC (N2200) includes the following functional blocks:

- Start up logic and reset control
- Charger detection

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- Battery voltage monitoring
- 32.768kHz clock with external crystal
- Real time clock with external backup battery
- SIM card interface
- Stereo audio codecs and amplifiers
- A/D converter
- Regulators
- Vibra interface
- Digital interface (CBUS)

EM ASIC N2300

The EM ASIC (N2300) includes the following functional blocks:

- Core supply generation
- Charge control circuitry
- Level shifter and regulator for USB/FBUS
- Current gauge for battery current measuring
- LED driver for backlights
- Digital interface (CBUS)

Device memories

RAP3GS memory POP2 stacked NOR flash and DDRAM

Modem memory consists of 128 Mbit DDRAM and 128 Mbit NOR flash memories. Memories are in same POP2 package and it is stacked on to RAP3GS.

DDRAM is a dynamic memory for ISA SW.

NOR is used for ISA SW code and PM data and CDSP (Cellular Digital Signal Processor) SW code.

Combo memory

The application memory of the device consists of NAND/DDR combo memory. The stacked DDR/NAND application memory has 512 Mbit of DDR memory and 1024 Mbit of flash memory.

Audio concept

Audio HW architecture

The functional core of the audio hardware is built around two ASICs: RAP 3G CMT engine ASIC and the mixed-signal ASIC VILMA.

VILMA provides an interface for the transducers and the accessory connector. Because audio amplifiers are also integrated into VILMA, the only discrete electronics components needed for audio paths are audio filtering components and EMC/ESD components.

There are three audio transducers:

- 7x11mm dynamic earpiece
- 11x15mm dynamic speaker
- electret microphone module

In addition to the audio transducers, VILMA also provides an output for the dynamic vibra component.

All galvanic audio accessories are connected to the Pop-Port™ accessory connector.

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A Bluetooth audio module (BC02) that is connected to RAP3GS supports Bluetooth audio functionality. There is a separate application ASIC, OMAP 1710, for Symbian applications.

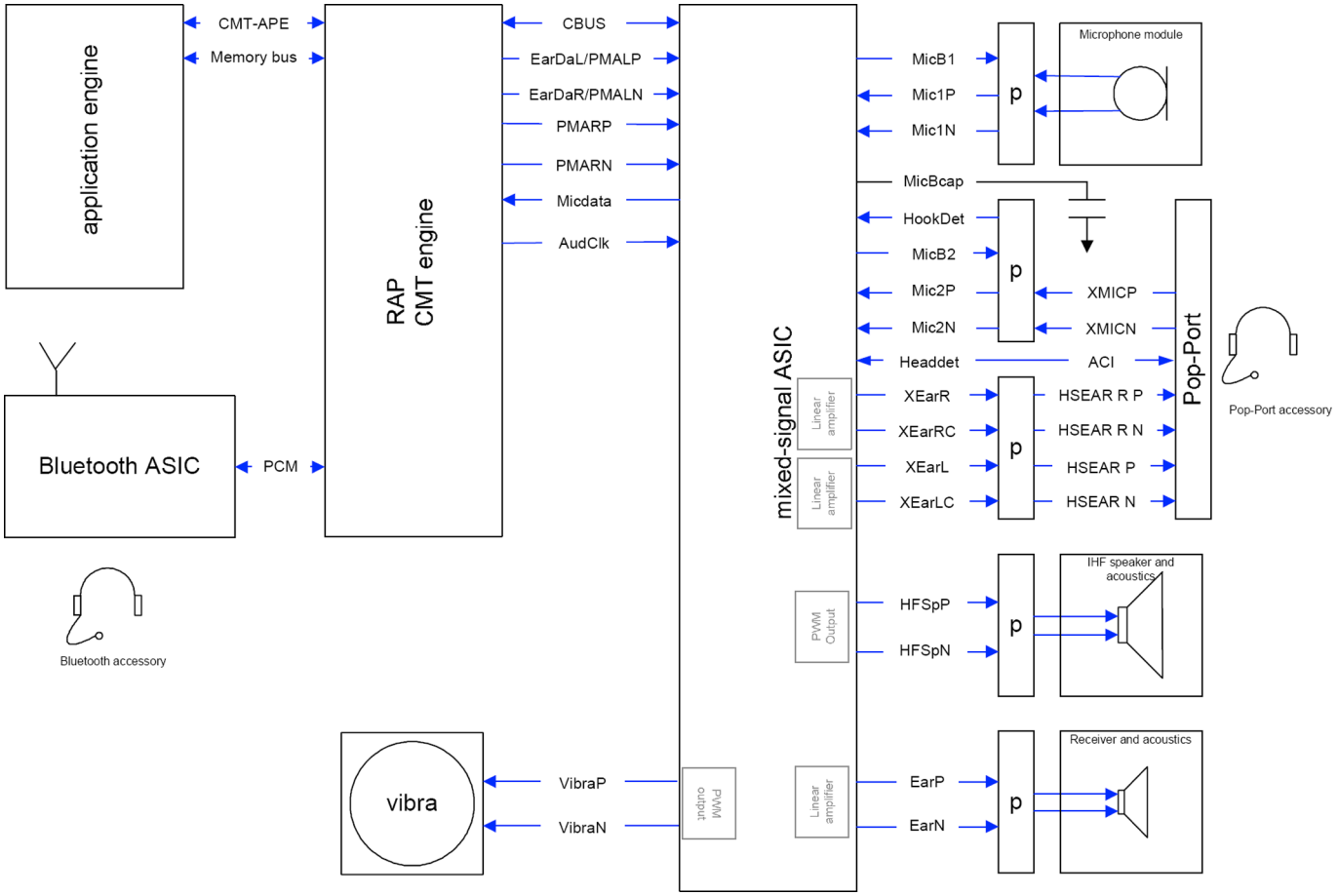

Figure 90 Audio block diagram

Internal microphone

Internal microphone is used for HandPortable (HP) and Internal HandsFree (IHF) call modes.

An analogue electret microphone is connected to Vilma ASIC's Mic1P and Mic1N is connected ground near Vilma.

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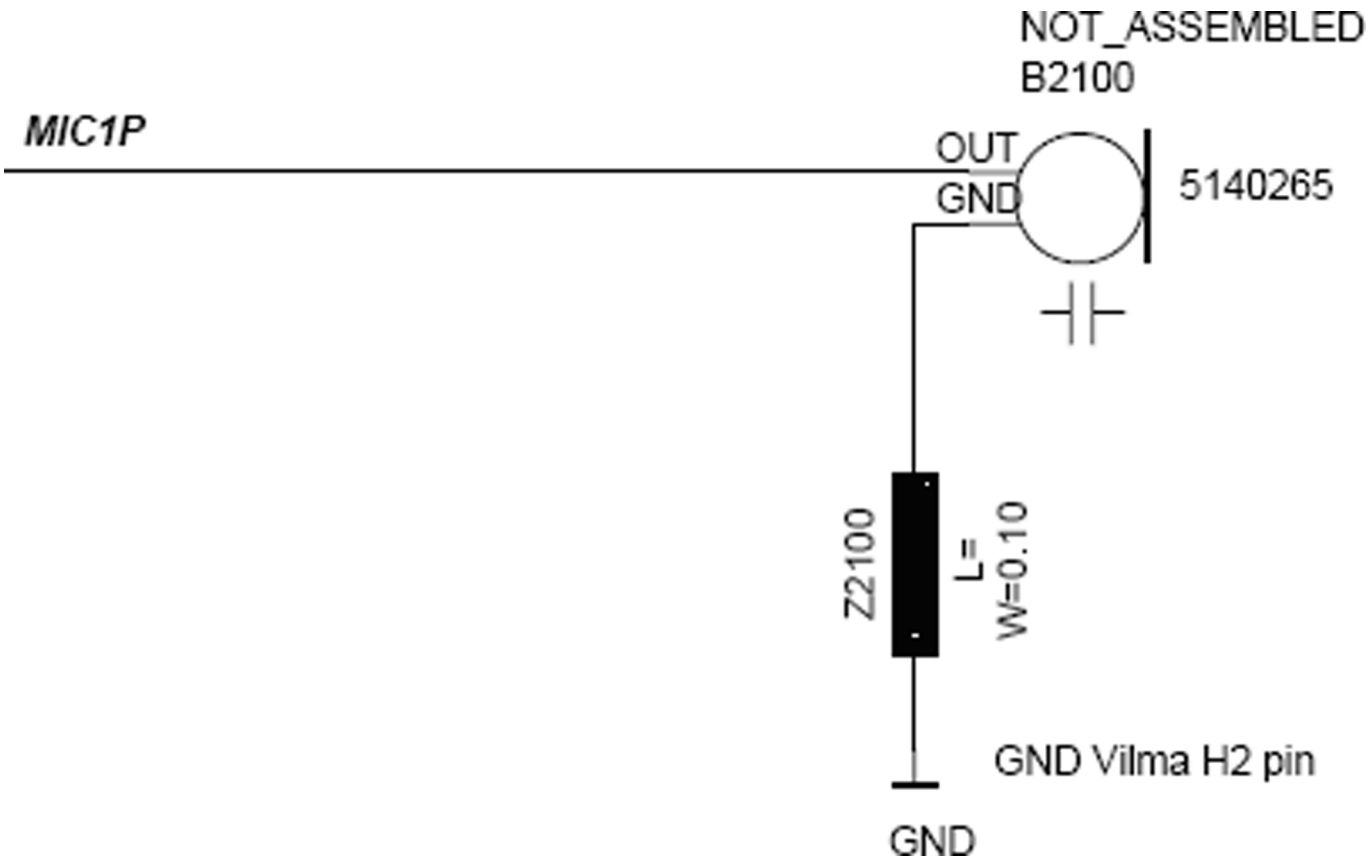

Figure 91 Internal microphone passive circuitry

External microphone

Galvanic accessories are connected to the system connector (Pop-Port™).

Accessory audio mode is automatically enabled/disabled during connection/disconnection of dedicated phone accessories.

External microphone circuitry is biased by Vilma ASIC MicB2 bias voltage (inside Vilma ASIP). The circuitry provides a symmetrical connection for the microphone from the Pop-Port™connections, XMICN and XMICP, to Vilma ASIC inputs, Mic2P and Mic2N.

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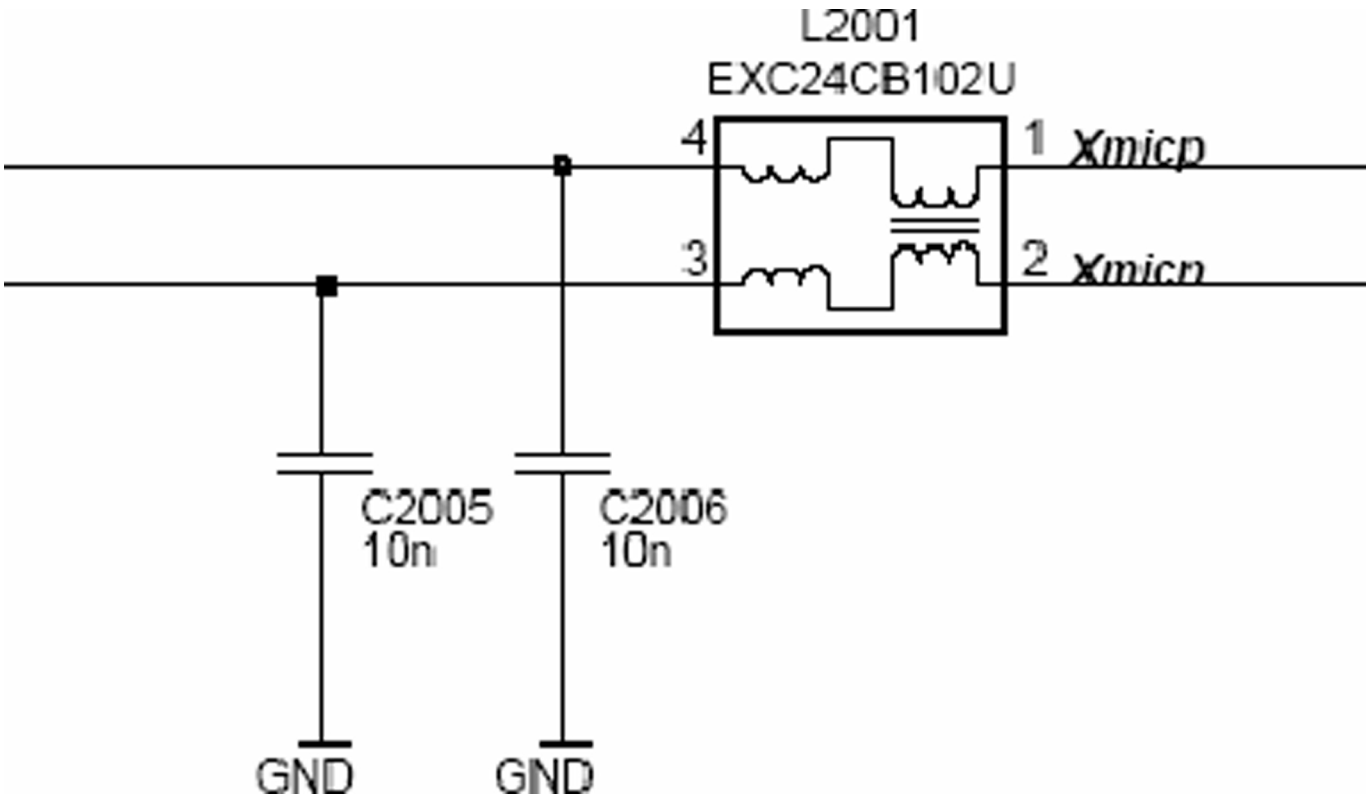

Figure 92 External microphone circuitry (Pop-Port connects to the right side)

Internal earpiece

The internal earpiece is used in the HandPortable (HP) call mode. A dynamic 7x11 mm earpiece capsule is connected to VILMA ASIC's differential outputs EarP and EarN.

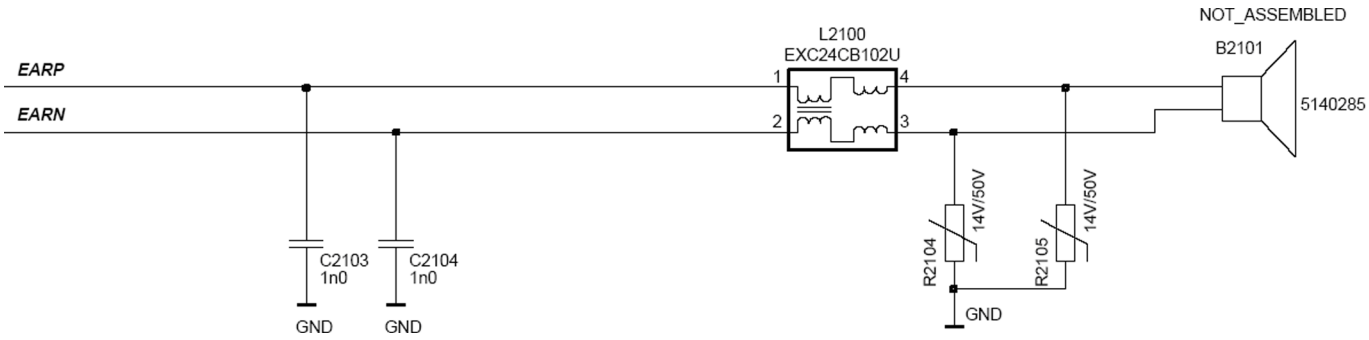

Figure 93 Internal earpiece circuitry

Internal speaker

The internal speaker is used in Internal HandsFree (IHF) call mode.

A dynamic 11x15mm speaker is connected to N2200 ASIC's outputs HFSpP and HFSpN.

The IHF amplifier integrated in EM ASIC N2200 is a Digital Pulse Modulated Amplifier (DPMA).

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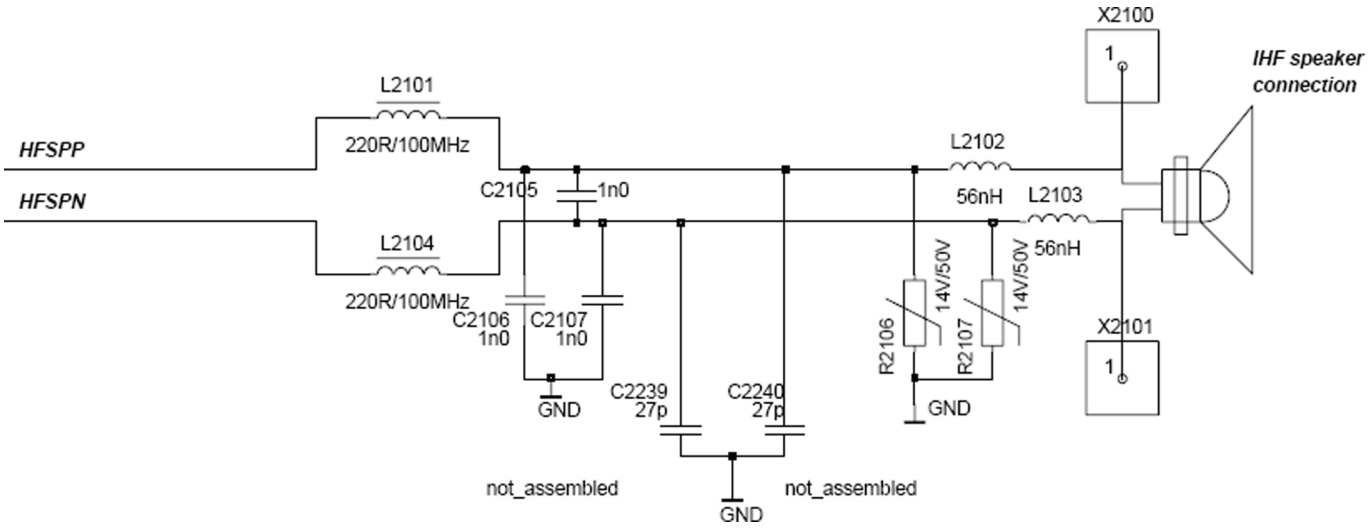

Figure 94 Internal speaker circuitry

External earpiece

All galvanic accessories are connected to the system connector (Pop-Port™).

The accessory audio mode is automatically enabled/disabled during connection/disconnection of dedicated phone accessories.

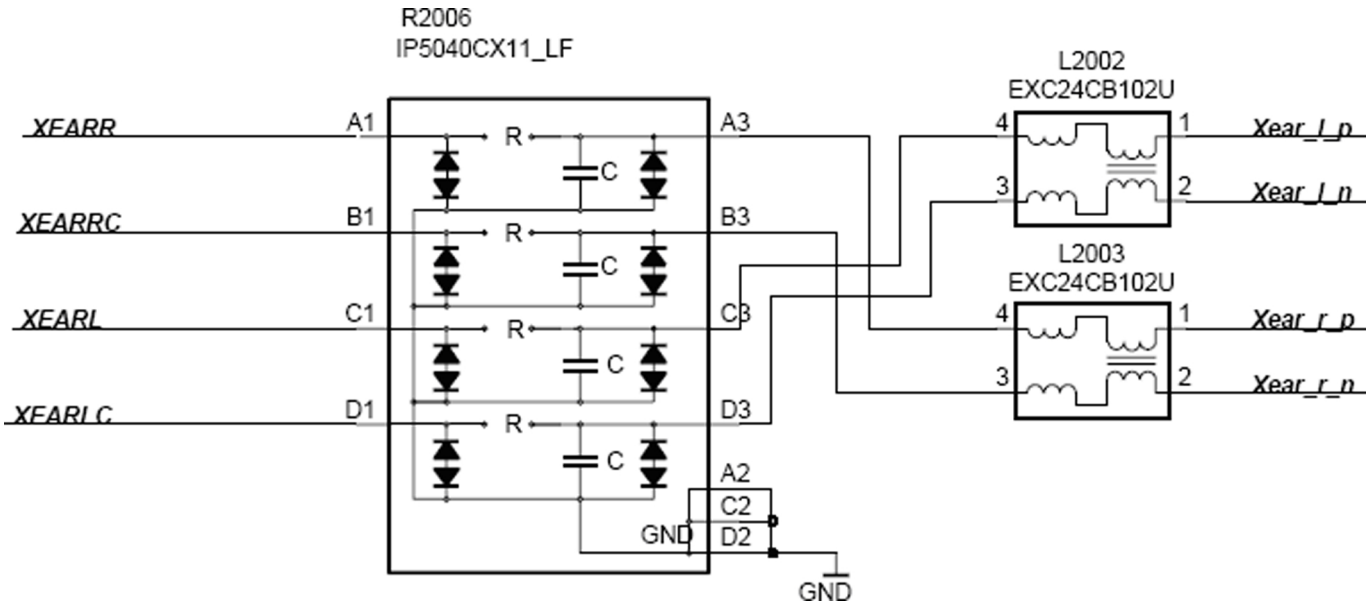

Figure 95 External earpiece circuitry (Pop-Port connected on the right)

Vibra circuitry

Vibra is used for vibra-alarm function.

The vibra motor is connected to the N2200 ASIC VibraP and VibraN Pulse Width Modulated (PWM) outputs.

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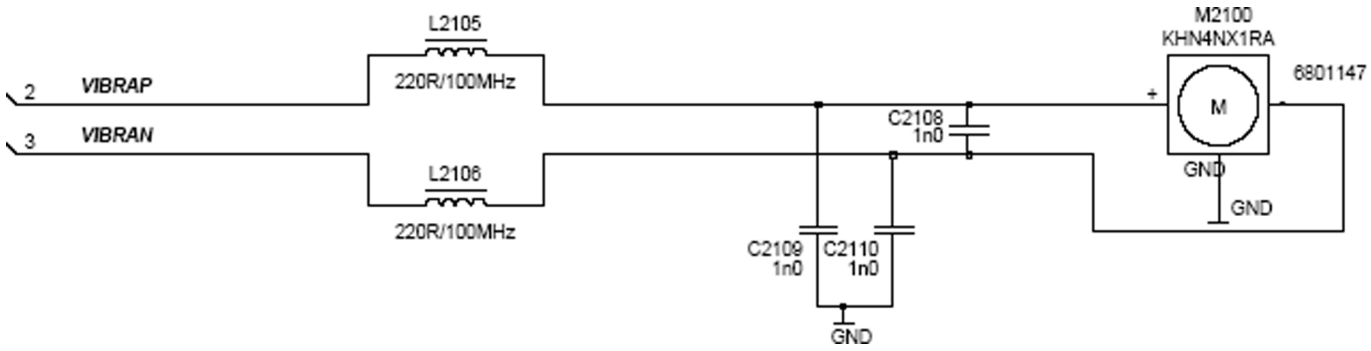

Figure 96 Vibra circuitry

Pop-port™ connector

Pop-Port™ connector provides a fully differential 4–wire stereo line-level output connection and fully differential 2-wire mono line-level or microphone level input connection.

The handsfree driver in Vilma is meant for the headset.

The output is driven in a fully differential mode. In the fully differential mode, the handsfree pin is the negative output and the HFCM pin is the positive output. The gain of the handsfree driver in the differential mode is 6 dB.

The earpiece and headset signals are multiplexed so that the outputs cannot be used simultaneously.

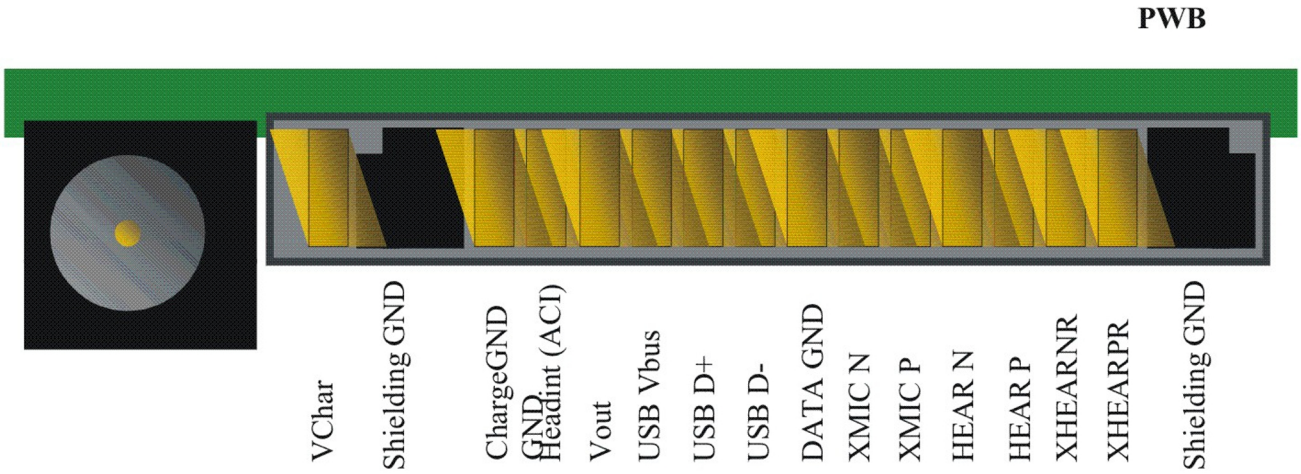

Figure 97 External audio connector

Table 25 Audio connector pin assignments

Pin #/ Signal name	Signal description	Spectral range	Voltage/ Current levels	Max or nominal serial impedance	Notes
1/ Charge	V Charge	DC	0-9V/ 0.85A		
2/ GND	Charge GND	-	0.85A	100mΩ (PWB+ conn.)	
3/ ACI	ACI	1kbits/s	Digital 0 / 2.5-2.78V	47Ω	Insertion & removal detection

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Pin #/ Signal name	Signal description	Spectral range	Voltage/ Current levels	Max or nominal serial impedance	Notes
4/ Vout	DC out	DC	2.78V 70 mA 2.5V 90mA	100mΩ (PWB+ conn.)	200mW
9 / XMIC N	Audio in	300-8k	$1V_{pp}$ & 2.5-2.78VDC		
10 / XMIC P	Audio in	300-8k	$1V_{pp}$ & 2.5-2.78VDC		
11 / HSEAR N	Audio out	20-20k	$1V_{pp}$	10Ω	
12 / HSEAR P	Audio out	20-20k	$1V_{pp}$	10Ω	
13 / HSEAR R N	Audio out	20-20k	$1V_{pp}$	10Ω	Not conn. in mono
14 / HSEAR R P	Audio out	20-20k	$1V_{pp}$	10Ω	Not conn. in mono

Baseband technical specifications

External interfaces

Name of Connection	Connector reference
USB	X2001
Charger	X2000
Headset	X2001
SIM	X2700
MicroSD	X5200
Battery connector	X2070

VOUT electrical characteristics

Description	Parameter	Min	Max	Typical	Unit	Notes
Vout regulator for external accessories	VOUT	2.43	2.57	2.5	V	Max load 90mA

SIM IF connections

Pin	Signal	I/O	Engine connection		Notes
C1	VSIM	Out	N2200	VSIM1	Supply voltage to SIM card, 1.8 V or 3.0 V.

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Pin	Signal	I/O	Engine connection		Notes
C2	SIMRST	Out	N2200	SIM1Rst	Reset signal to SIM card
C3	SIMCLK	Out	N2200	SIM1ClkC	Clock signal to SIM card
C5	GND	-	GND		Ground
C7	SIMDATA	In/Out	N2200	SIM1DaC	Data input / output

MicroSD interface connections

Table 26 MicroSD interface connections (SD mode)

Pin	Signal	I/O	Engine connection		Notes
Reader					
1	CD/DAT3		HELEN3	MMC2_DAT3	Card Detect / Data Line [Bit 3]
2	CMD	<->	HELEN3	MMC2_CMD	Command/Response
3	V_{SS1}		GND		Ground
4	V_{DD}	<-	Regulator	VCC_{SD}	3.0V Regulator (Max 200mA)
5	CLK	<-	HELEN3	MMC2_CLK	External clock for the microSD card (Max 25MHz)
6	V_{SS2}		GND		Ground
7	DAT0	<->	HELEN3	MMC2_DAT0	Data Line [Bit 0]
8	DAT1	<->	HELEN3	MMC2_DAT1	Data Line [Bit 1]
9	DAT2	<->	HELEN3	MMC2_DAT2	Data Line [Bit 2]
10	NC				Not connected
11	NC				Not connected
		->	HELEN3		Card detection switch
LS					
C2	10A2	->	HELEN3	MMC2_CLKIN	Return clock
D1	9DIR	<-	HELEN3	MMC2_CMDDIR	CMD direction
B4	1DIR	<-	HELEN3	MMC_DATDIR0	Data direction
A4	2DIR	<-	HELEN3	MMC2_DATDIR1	Data direction 1

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Pin	Signal	I/O	Engine connection		Notes
REG					
	VEN	<-	HELEN3	GPIO41	microSD regulator enable
Misc.					
		->	HELEN3		Battery cover switch

Charger connector and charging interface connections & electrical characteristics

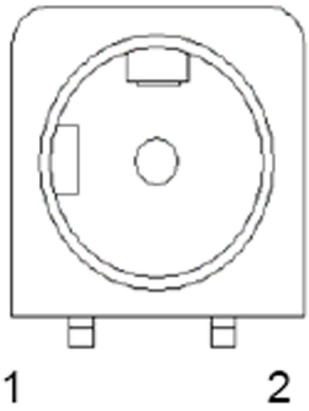

Figure 98 Charger connector

Table 27 Charging interface connections

Pin	Signal	I/O	Engine connection		Notes
1	Vchar	In	N2300	VCharIn1, 2	Charging voltage / charger detection, Center pin
2	Charge GND		Ground		Charger ground

Table 28 Charging IF electrical characteristics

Description	Parameter	Min	Max	Unit	Notes
Vchar	V Charge	0	9	V	Center pin
Vchar	I Charge		0.85	A	Center pin
Charge GND			0.85	A	
Threshold for charging, rising (N2300)	V_{MSTR+}	2.1		V	Typical value
Threshold for charging, falling (N2300)	V_{MSTR-}	1.9		V	Typical value

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Battery connector and interface connections & electrical characteristics

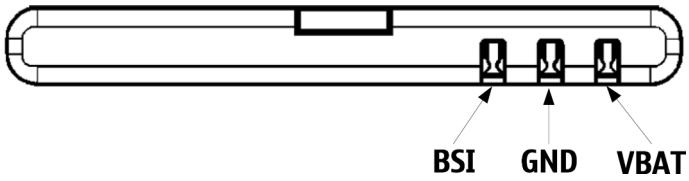

Figure 99 Battery connector

Table 29 Battery interface connections

Pin	Signal	I/O	Engine connection		Notes
1	VBAT	->	EM ASIC N2200	VBAT	Battery voltage
2	BSI	->	EM ASIC N2200	BSI	Battery size indication (fixed resistor inside the battery pack)
3	GND		GND		Ground

Table 30 Battery IF electrical characteristics

Description	Parameter	Max	Unit
Operation voltage	V_{IN}	4.23	VDC
Current rating	I_{IN}	0.9	A

Internal interfaces

Name of Connection	Connector reference
Display	X4400
ALS	V4400
Vibra	M2100
Microphone	B2100
Earpiece	B2101
IHF speaker	B2102
Side button	X4501

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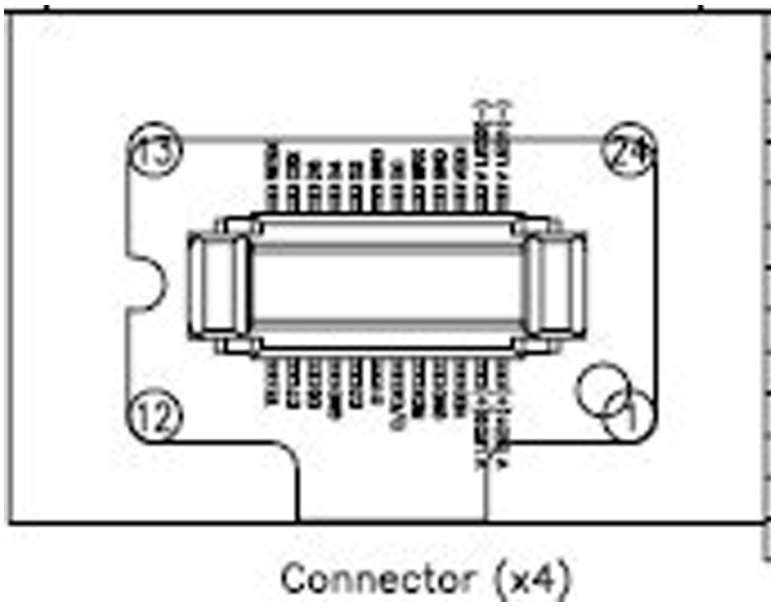
Display connector and interface connections



PIN#	Symbol	Symbol	PIN#
12	TE	RESX	13
11	D7	CSX	14
10	D5	D6	15
9	GND	D4	16
8	D3	D2	17
7	D1	GND	18
6	D/CX	D0	19
5	RDX	WRX	20
4	GND	GND	21
3	VDD	VDDI	22
2	V LED2(+)	V LED2(−)	23
1	V LED1(+)	V LED1(−)	24

Figure 100 Display connector

Table 31 Display interface connections

Pin	Signal	I/O	Engine connection		Notes
1	V LED1 +	<-	N2301	VLEDout	N2301 is controlled by Betty
2	V LED2 +	<-	N2301	VLEDout	N2301 is controlled by Betty
3	VDD	<-	EM ASIC N2200	VAUX	Core Voltage
4	GND				
5	RDX	<-	Application processor	Lcdrdx	Read Enable (active low)
6	D/CX	<-	Application processor	Lcdrmd	Data/ Command select (high = data low = command)
7	D1	<->	Application processor	Lcdda1	Data
8	D3	<->	Application processor	Lcdda3	Data
9	GND				

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Pin	Signal	I/O	Engine connection		Notes
10	D5	<->	Application processor	Lcdda5	Data
11	D7	<->	Application processor	Lcdda7	Data
12	TE	->	Application processor	Te	Tearing Effect
13	RESX	<-	Application processor	Gpio60	Reset (active low)
14	CSX	<-	Application processor	Lcdsx	Chip Select (active low)
15	D6	<->	Application processor	Lcdda6	Data
16	D4	<->	Application processor	Lcdda4	Data
17	D2	<->	Application processor	Lcdda2	Data
18	GND				
19	D0	<->	Application processor	Lcdda0	Data
20	WRX	->	Application processor	Lcdwrx	Write Enable (active low)
21	GND				
22	VDDI	<-	EM ASIC N2200	VIO	Interface voltage
23	V LED2 -	->	R2303	SETCURR1	Resistor
24	V LED1 -	->	R2303	SETCURR1	Resistor

Back-up battery interface electrical characteristics

Table 32 Back-up battery connections

Pin name	I/O	Connection	Notes
L2207, VBack	->	N2200, VBack	Back-up battery G2200 is connected to N2200 via coil

Table 33 Back-up battery electrical characteristics

Description	Parameter	Min	Typ	Max	Unit
Back-Up Battery Voltage	Vback	0	2.5	2.7	V

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RF description

Introduction to receiver functionality

Receiver functions are implemented in RF ASIC N7500.

The receiver is a linear direct conversion receiver containing LNA, band pass filter and demodulator for each supported system and band. A second band filter is used between the LNA and demodulator in WCDMA.

After the demodulators the signal paths are combined to one common BB path.

WCDMA receiver

In WCDMA mode the received signal is fed from the antenna to the BAW duplex filter. After the duplex filter the signal goes via balun to the integrated LNA in N7500. After the LNA the signal goes trough band pass filter.

After filtering the signal goes to the down conversion mixer, which converts the signal into baseband I and Q signals (90 degrees phase shift). After the demodulator output there is a RC low pass filter with f0 of ca. 1.5 MHz.

The Rx channel filter must be calibrated with an automatic routine whenever N7500 IC is changed to a phone.

In WCDMA mode the corner frequency of the filter is set to ca. 2.1MHz. The filter is followed by an AGC amplifier with adjustable gain. Signal is further amplified before it is fed to balanced analog IQ output pins. Analog output pins are accompanied by reference voltage output, which sets the DC level for the AD converter in BB ASIC.

GSM receiver

As GSM850, GSM900, GSM1800 and GSM1900 RX branches are functionally identical, the following description is applicable to all of them.

The received signal goes from the GSM antenna to the antenna switch module. The switch module contains PIN diode switches for band and RX/TX. The antenna switch module is followed by integrated LNA stages in the RF ASIC. The LNAs are followed by demodulators which downconvert the signal to baseband I and Q signals.

In the BB-chain there are two adjustable gain stages and one mode specific gain. The first one called BB-gain is just after the demodulator. It has a 12 dB gain range with 6dB steps. After the BB-gain there is the channel select filter.

Main AGC amplifier proceeds the channel selection filter. It has 30 dB of gain control range with 3 dB steps. Final amplifier stage is used as an output buffer for IQ signals. This stage is set to 0 dB gain in GSM mode.

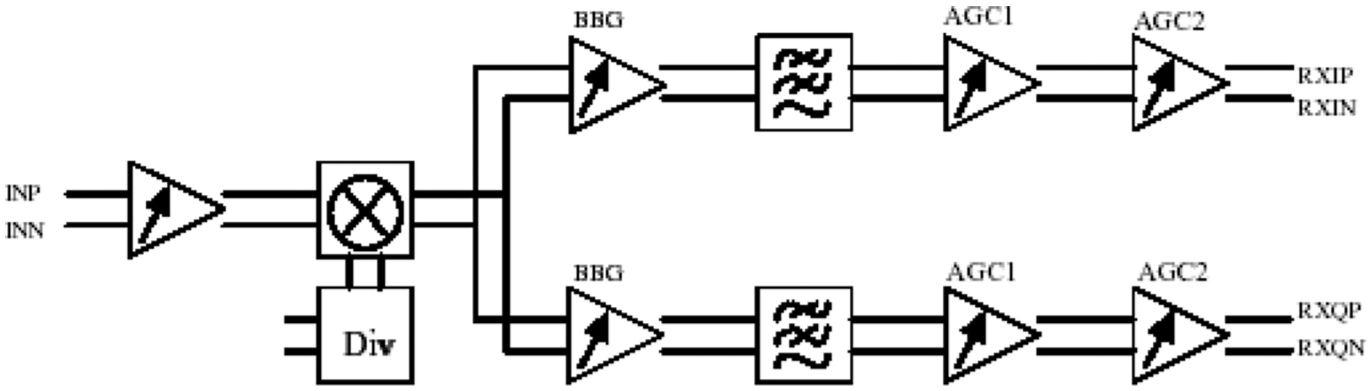

Figure 101 GSM receiver after the antenna switch

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Introduction to transmitter functionality

Transmitter functions are implemented in the ASIC N7500. It contains a BB frequency low pass filter, which is tunable according to the signal bandwidth of the system in use. In addition N7500 contain three separate RF paths (GSM850/900, GSM1800/1900 and WCDMA1900/2100) comprising of a final frequency IQ modulator and VGA amplifiers.

WCDMA transmitter

In the transmitter side, an analogue I/Q modulated signal is received from the digital baseband into N7500 and fed through the low pass filter. The corner frequency of the filter is set to approximately 3 MHz.

After the filter the signal is fed to the IQ modulator, which converts the signal to final Tx frequency. There are two separate I/Q modulators:.one for WCDMA and another for GSM850/EGSM900 and DCS1800/PCS1900 signals.

The WCDMA branch is selected by biasing the appropriate modulator. The modulator is followed by two VGA stages giving (85 dB) of gain control range. The signal then exits N7500 via a balanced line.

After the PA the transmitted WCDMA signal is fed through a duplex filter to the antenna.

WCDMA power control

WCDMA TX power control is done by the two VGA stages in N7500 ASIC. The VGA have a common temperature compensation circuit and one voltage mode analog input for gain control (TXC).

The gain of the VGA amplifier chain is controlled by a DA converter in BB. The same DA converter is shared by GSM Tx power control function.

WCDMA PA module

The WCDMA PA is housed in a separate module having:

- a variable supply voltage input for the amplifier stages (Vcc11),
- a battery supply voltage for the bias circuits (Vcc12),
- one bias current inputs.

Bias currents are generated by 5-bit DA (DAC201) converter in N7500 RF ASIC. The converter is controlled via RFBus.

PA DCDC converter

A 5 bit DA (DAC101) converter in N7500 RF ASIC controls the DC-DC converter. The converter is controlled via RFBus. The DCDC converter limits the lowest supply voltage to 1.3 V. At highest power levels the DCDC converter output settles nominally to 3.1 V.

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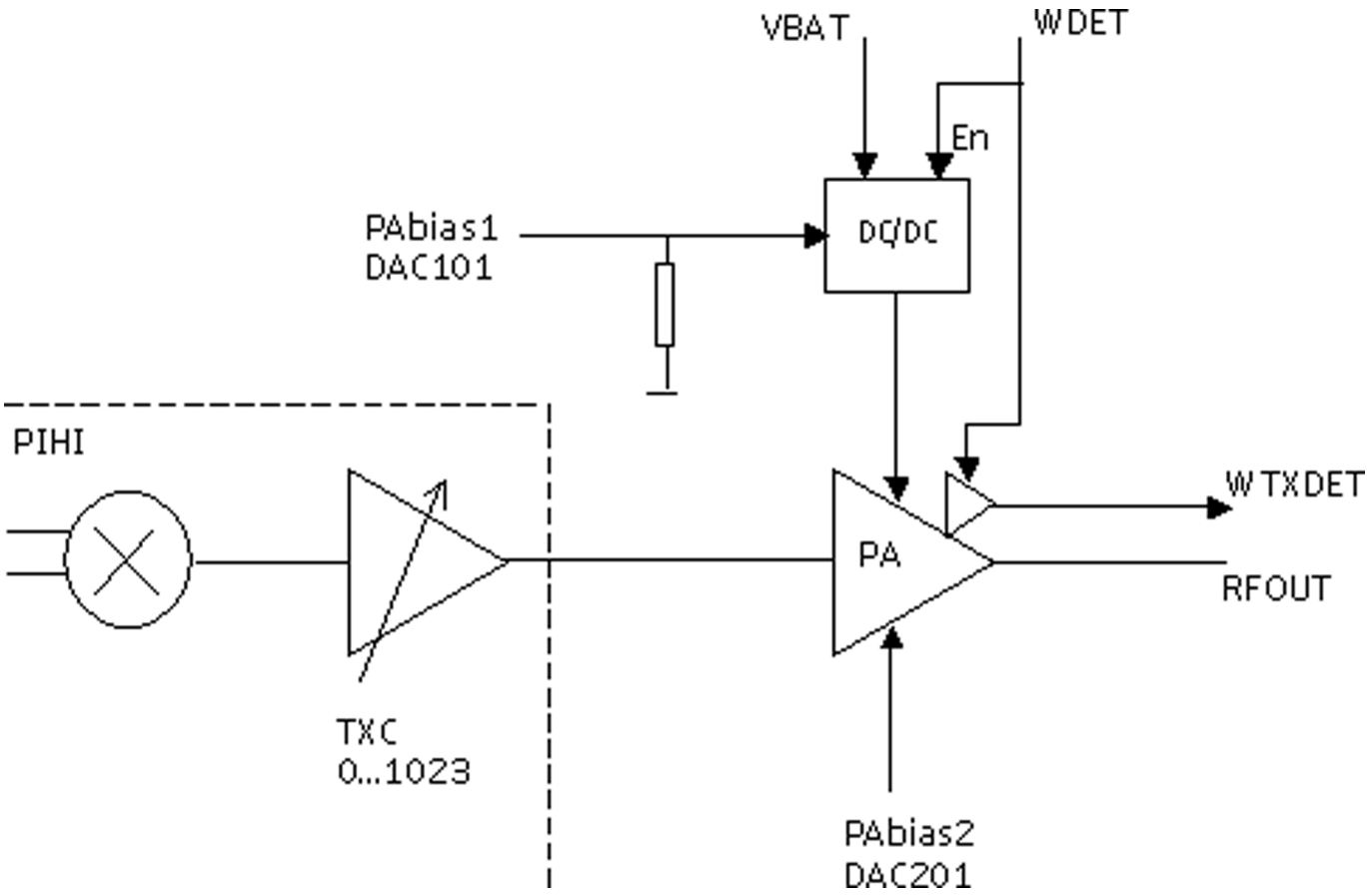

Figure 102 Block diagram of DCDC converter and WCDMA PA

GSM transmitter

An analog IQ modulated signal is fed to N7500 from Digital BB in current form. It is first low pass filtered with filter corner frequency set to ca. 200 kHz. After the filter the signal is routed to the GSM modulator. The appropriate routing after the modulator is selected by biasing either GSM850/EGSM900 or DCS1800/PCS1900 variable gain amplifier. The amplifier gives 55 dB of power control dynamic range.

After the VGA stage the signal exits N7500. In case of DCS1800/PCS1900 the signal goes directly to the GSM PA module. In case of GSM850/EGSM900 the PA module is preceded by a switch able SAW filter. After the filter, the signal is fed to GSM TX front-end module (TXFEM), which also contains antenna switch.

GSM power control

A closed control loop comprising of an integrated power detector (in PA module) and an error amplifier, which is integrated in N7500, controls GSM transmitter power. Detector output from the PA gives a DC level proportional to the output power.

Note: Timings are not shown accurately in the previous figure.

GSM PA module

TXFEM module contains two separate amplifier chains, one for GSM850/EGSM900 and another for DCS1800/PCS1900. Both amplifiers have a battery supply connection and two bias current inputs.

Frequency synthesizers

RF have separate synthesizers for WCDMA RX and WCDMA TX / one for GSM TX / RX.

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Reference oscillators

As a reference oscillator for the frequency synthesizers a 38.4MHz VCTCXO (voltage controlled temperature compensated crystal oscillator) is used.

Regulators

RF is combined with mixed mode ASIC Betty that contains the DA converters for power control and AFC functions, a slow AD converter for WCDMA power detection and other measurements. It also contains a regulator for VCTXCO and it's peripherals.

N7500 contain integrated regulators to supply regulated voltages for their internal circuitry and other RF parts.

Antenna connections

Device includes two different PIFA type antennas. WCDMA antenna has one feed and one ground contact. GSM antenna is like normal dual band PIFA antenna (one feed and one ground point) but then there is also extra ground point, which is connected certain point of the PIFA element. That point has been grounded via PHEMT switch to certain load so that antenna resonance will spread. This way it is possible to have two different dual band antennas (900/1800 or 850/1900). All contacts are made with C-clips springs. BT/WLAN antenna consists of a ceramic resonator.

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Frequency mappings

GSM850 frequencies

CH	TX	RX	VCO TX	VCO RX	CH	TX	RX	VCO TX	VCO RX	CH	TX	RX	VCO TX	VCO RX
128	824.2	869.2	3296.8	3476.8	170	832.6	877.6	3330.4	3510.4	212	841.0	886.0	3364.0	3544.0
129	824.4	869.4	3297.6	3477.6	171	832.8	877.8	3331.2	3511.2	213	841.2	886.2	3364.8	3544.8
130	824.6	869.6	3298.4	3478.4	172	833.0	878.0	3332.0	3512.0	214	841.4	886.4	3365.6	3545.6
131	824.8	869.8	3299.2	3479.2	173	833.2	878.2	3332.8	3512.8	215	841.6	886.6	3366.4	3546.4
132	825.0	870.0	3300.0	3480.0	174	833.4	878.4	3333.6	3513.6	216	841.8	886.8	3367.2	3547.2
133	825.2	870.2	3300.8	3480.8	175	833.6	878.6	3334.4	3514.4	217	842.0	887.0	3368.0	3548.0
134	825.4	870.4	3301.6	3481.6	176	833.8	878.8	3335.2	3515.2	218	842.2	887.2	3368.8	3548.8
135	825.6	870.6	3302.4	3482.4	177	834.0	879.0	3336.0	3516.0	219	842.4	887.4	3369.6	3549.6
136	825.8	870.8	3303.2	3483.2	178	834.2	879.2	3336.8	3516.8	220	842.6	887.6	3370.4	3550.4
137	826.0	871.0	3304.0	3484.0	179	834.4	879.4	3337.6	3517.6	221	842.8	887.8	3371.2	3551.2
138	826.2	871.2	3304.8	3484.8	180	834.6	879.6	3338.4	3518.4	222	843.0	888.0	3372.0	3552.0
139	826.4	871.4	3305.6	3485.6	181	834.8	879.8	3339.2	3519.2	223	843.2	888.2	3372.8	3552.8
140	826.6	871.6	3306.4	3486.4	182	835.0	880.0	3340.0	3520.0	224	843.4	888.4	3373.6	3553.6
141	826.8	871.8	3307.2	3487.2	183	835.2	880.2	3340.8	3520.8	225	843.6	888.6	3374.4	3554.4
142	827.0	872.0	3308.0	3488.0	184	835.4	880.4	3341.6	3521.6	226	843.8	888.8	3375.2	3555.2
143	827.2	872.2	3308.8	3488.8	185	835.6	880.6	3342.4	3522.4	227	844.0	889.0	3376.0	3556.0
144	827.4	872.4	3309.6	3489.6	186	835.8	880.8	3343.2	3523.2	228	844.2	889.2	3376.8	3556.8
145	827.6	872.6	3310.4	3490.4	187	836.0	881.0	3344.0	3524.0	229	844.4	889.4	3377.6	3557.6
146	827.8	872.8	3311.2	3491.2	188	836.2	881.2	3344.8	3524.8	230	844.6	889.6	3378.4	3558.4
147	828.0	873.0	3312.0	3492.0	189	836.4	881.4	3345.6	3525.6	231	844.8	889.8	3379.2	3559.2
148	828.2	873.2	3312.8	3492.8	190	836.6	881.6	3346.4	3526.4	232	845.0	890.0	3380.0	3560.0
149	828.4	873.4	3313.6	3493.6	191	836.8	881.8	3347.2	3527.2	233	845.2	890.2	3380.8	3560.8
150	828.6	873.6	3314.4	3494.4	192	837.0	882.0	3348.0	3528.0	234	845.4	890.4	3381.6	3561.6
151	828.8	873.8	3315.2	3495.2	193	837.2	882.2	3348.8	3528.8	235	845.6	890.6	3382.4	3562.4
152	829.0	874.0	3316.0	3496.0	194	837.4	882.4	3349.6	3529.6	236	845.8	890.8	3383.2	3563.2
153	829.2	874.2	3316.8	3496.8	195	837.6	882.6	3350.4	3530.4	237	846.0	891.0	3384.0	3564.0
154	829.4	874.4	3317.6	3497.6	196	837.8	882.8	3351.2	3531.2	238	846.2	891.2	3384.8	3564.8
155	829.6	874.6	3318.4	3498.4	197	838.0	883.0	3352.0	3532.0	239	846.4	891.4	3385.6	3565.6
156	829.8	874.8	3319.2	3499.2	198	838.2	883.2	3352.8	3532.8	240	846.6	891.6	3386.4	3566.4
157	830.0	875.0	3320.0	3500.0	199	838.4	883.4	3353.6	3533.6	241	846.8	891.8	3387.2	3567.2
158	830.2	875.2	3320.8	3500.8	200	838.6	883.6	3354.4	3534.4	242	847.0	892.0	3388.0	3568.0
159	830.4	875.4	3321.6	3501.6	201	838.8	883.8	3355.2	3535.2	243	847.2	892.2	3388.8	3568.8
160	830.6	875.6	3322.4	3502.4	202	839.0	884.0	3356.0	3536.0	244	847.4	892.4	3389.6	3569.6
161	830.8	875.8	3323.2	3503.2	203	839.2	884.2	3356.8	3536.8	245	847.6	892.6	3390.4	3570.4
162	831.0	876.0	3324.0	3504.0	204	839.4	884.4	3357.6	3537.6	246	847.8	892.8	3391.2	3571.2
163	831.2	876.2	3324.8	3504.8	205	839.6	884.6	3358.4	3538.4	247	848.0	893.0	3392.0	3572.0
164	831.4	876.4	3325.6	3505.6	206	839.8	884.8	3359.2	3539.2	248	848.2	893.2	3392.8	3572.8
165	831.6	876.6	3326.4	3506.4	207	840.0	885.0	3360.0	3540.0	249	848.4	893.4	3393.6	3573.6
166	831.8	876.8	3327.2	3507.2	208	840.2	885.2	3360.8	3540.8	250	848.6	893.6	3394.4	3574.4
167	832.0	877.0	3328.0	3508.0	209	840.4	885.4	3361.6	3541.6	251	848.8	893.8	3395.2	3575.2

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EGSM900 frequencies

CH	TX	RX	VCO TX	VCO RX	CH	TX	RX	VCO TX	VCO RX	CH	TX	RX	VCO TX	VCO RX
975	880,2	925,2	3520,8	3700,8	1	890,2	935,2	3560,8	3740,8	63	902,6	947,6	3610,4	3790,4
976	880,4	925,4	3521,6	3701,6	2	890,4	935,4	3561,6	3741,6	64	902,8	947,8	3611,2	3791,2
977	880,6	925,6	3522,4	3702,4	3	890,6	935,6	3562,4	3742,4	65	903,0	948,0	3612,0	3792,0
978	880,8	925,8	3523,2	3703,2	4	890,8	935,8	3563,2	3743,2	66	903,2	948,2	3612,8	3792,8
979	881,0	926,0	3524,0	3704,0	5	891,0	936,0	3564,0	3744,0	67	903,4	948,4	3613,6	3793,6
980	881,2	926,2	3524,8	3704,8	6	891,2	936,2	3564,8	3744,8	68	903,6	948,6	3614,4	3794,4
981	881,4	926,4	3525,6	3705,6	7	891,4	936,4	3565,6	3745,6	69	903,8	948,8	3615,2	3795,2
982	881,6	926,6	3526,4	3706,4	8	891,6	936,6	3566,4	3746,4	70	904,0	949,0	3616,0	3796,0
983	881,8	926,8	3527,2	3707,2	9	891,8	936,8	3567,2	3747,2	71	904,2	949,2	3616,8	3796,8
984	882,0	927,0	3528,0	3708,0	10	892,0	937,0	3568,0	3748,0	72	904,4	949,4	3617,6	3797,6
985	882,2	927,2	3528,8	3708,8	11	892,2	937,2	3568,8	3748,8	73	904,6	949,6	3618,4	3798,4
986	882,4	927,4	3529,6	3709,6	12	892,4	937,4	3569,6	3749,6	74	904,8	949,8	3619,2	3799,2
987	882,6	927,6	3530,4	3710,4	13	892,6	937,6	3570,4	3750,4	75	905,0	950,0	3620,0	3800,0
988	882,8	927,8	3531,2	3711,2	14	892,8	937,8	3571,2	3751,2	76	905,2	950,2	3620,8	3800,8
989	883,0	928,0	3532,0	3712,0	15	893,0	938,0	3572,0	3752,0	77	905,4	950,4	3621,6	3801,6
990	883,2	928,2	3532,8	3712,8	16	893,2	938,2	3572,8	3752,8	78	905,6	950,6	3622,4	3802,4
991	883,4	928,4	3533,6	3713,6	17	893,4	938,4	3573,6	3753,6	79	905,8	950,8	3623,2	3803,2
992	883,6	928,6	3534,4	3714,4	18	893,6	938,6	3574,4	3754,4	80	906,0	951,0	3624,0	3804,0
993	883,8	928,8	3535,2	3715,2	19	893,8	938,8	3575,2	3755,2	81	906,2	951,2	3624,8	3804,8
994	884,0	929,0	3536,0	3716,0	20	894,0	939,0	3576,0	3756,0	82	906,4	951,4	3625,6	3805,6
995	884,2	929,2	3536,8	3716,8	21	894,2	939,2	3576,8	3756,8	83	906,6	951,6	3626,4	3806,4
996	884,4	929,4	3537,6	3717,6	22	894,4	939,4	3577,6	3757,6	84	906,8	951,8	3627,2	3807,2
997	884,6	929,6	3538,4	3718,4	23	894,6	939,6	3578,4	3758,4	85	907,0	952,0	3628,0	3808,0
998	884,8	929,8	3539,2	3719,2	24	894,8	939,8	3579,2	3759,2	86	907,2	952,2	3628,8	3808,8
999	885,0	930,0	3540,0	3720,0	25	895,0	940,0	3580,0	3760,0	87	907,4	952,4	3629,6	3809,6
1000	885,2	930,2	3540,8	3720,8	26	895,2	940,2	3580,8	3760,8	88	907,6	952,6	3630,4	3810,4
1001	885,4	930,4	3541,6	3721,6	27	895,4	940,4	3581,6	3761,6	89	907,8	952,8	3631,2	3811,2
1002	885,6	930,6	3542,4	3722,4	28	895,6	940,6	3582,4	3762,4	90	908,0	953,0	3632,0	3812,0
1003	885,8	930,8	3543,2	3723,2	29	895,8	940,8	3583,2	3763,2	91	908,2	953,2	3632,8	3812,8
1004	886,0	931,0	3544,0	3724,0	30	896,0	941,0	3584,0	3764,0	92	908,4	953,4	3633,6	3813,6
1005	886,2	931,2	3544,8	3724,8	31	896,2	941,2	3584,8	3764,8	93	908,6	953,6	3634,4	3814,4
1006	886,4	931,4	3545,6	3725,6	32	896,4	941,4	3585,6	3765,6	94	908,8	953,8	3635,2	3815,2
1007	886,6	931,6	3546,4	3726,4	33	896,6	941,6	3586,4	3766,4	95	909,0	954,0	3636,0	3816,0
1008	886,8	931,8	3547,2	3727,2	34	896,8	941,8	3587,2	3767,2	96	909,2	954,2	3636,8	3816,8
1009	887,0	932,0	3548,0	3728,0	35	897,0	942,0	3588,0	3768,0	97	909,4	954,4	3637,6	3817,6
1010	887,2	932,2	3548,8	3728,8	36	897,2	942,2	3588,8	3768,8	98	909,6	954,6	3638,4	3818,4
1011	887,4	932,4	3549,6	3729,6	37	897,4	942,4	3589,6	3769,6	99	909,8	954,8	3639,2	3819,2
1012	887,6	932,6	3550,4	3730,4	38	897,6	942,6	3590,4	3770,4	100	910,0	955,0	3640,0	3820,0
1013	887,8	932,8	3551,2	3731,2	39	897,8	942,8	3591,2	3771,2	101	910,2	955,2	3640,8	3820,8
1014	888,0	933,0	3552,0	3732,0	40	898,0	943,0	3592,0	3772,0	102	910,4	955,4	3641,6	3821,6
1015	888,2	933,2	3552,8	3732,8	41	898,2	943,2	3592,8	3772,8	103	910,6	955,6	3642,4	3822,4
1016	888,4	933,4	3553,6	3733,6	42	898,4	943,4	3593,6	3773,6	104	910,8	955,8	3643,2	3823,2
1017	888,6	933,6	3554,4	3734,4	43	898,6	943,6	3594,4	3774,4	105	911,0	956,0	3644,0	3824,0
1018	888,8	933,8	3555,2	3735,2	44	898,8	943,8	3595,2	3775,2	106	911,2	956,2	3644,8	3824,8
1019	889,0	934,0	3556,0	3736,0	45	899,0	944,0	3596,0	3776,0	107	911,4	956,4	3645,6	3825,6
1020	889,2	934,2	3556,8	3736,8	46	899,2	944,2	3596,8	3776,8	108	911,6	956,6	3646,4	3826,4
1021	889,4	934,4	3557,6	3737,6	47	899,4	944,4	3597,6	3777,6	109	911,8	956,8	3647,2	3827,2
1022	889,6	934,6	3558,4	3738,4	48	899,6	944,6	3598,4	3778,4	110	912,0	957,0	3648,0	3828,0
1023	889,8	934,8	3559,2	3739,2	49	899,8	944,8	3599,2	3779,2	111	912,2	957,2	3648,8	3828,8
0	890,0	935,0	3560,0	3740,0	50	900,0	945,0	3600,0	3780,0	112	912,4	957,4	3649,6	3829,6
					51	900,2	945,2	3600,8	3780,8	113	912,6	957,6	3650,4	3830,4
					52	900,4	945,4	3601,6	3781,6	114	912,8	957,8	3651,2	3831,2
					53	900,6	945,6	3602,4	3782,4	115	913,0	958,0	3652,0	3832,0
					54	900,8	945,8	3603,2	3783,2	116	913,2	958,2	3652,8	3832,8
					55	901,0	946,0	3604,0	3784,0	117	913,4	958,4	3653,6	3833,6
					56	901,2	946,2	3604,8	3784,8	118	913,6	958,6	3654,4	3834,4
					57	901,4	946,4	3605,6	3785,6	119	913,8	958,8	3655,2	3835,2
					58	901,6	946,6	3606,4	3786,4	120	914,0	959,0	3656,0	3836,0
					59	901,8	946,8	3607,2	3787,2	121	914,2	959,2	3656,8	3836,8
					60	902,0	947,0	3608,0	3788,0	122	914,4	959,4	3657,6	3837,6
					61	902,2	947,2	3608,8	3788,8	123	914,6	959,6	3658,4	3838,4
					62	902,4	947,4	3609,6	3789,6	124	914,8	959,8	3659,2	3839,2

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GSM1800 frequencies

Ch	Tx	Rx	VCO Tx	VCO Rx	Ch	Tx	Rx	VCO Tx	VCO Rx	Ch	Tx	Rx	VCO Tx	VCO Rx	Ch	Tx	Rx	VCO Tx	VCO Rx
512	1710.2	1805.2	3420.4	3610.4	606	1729.0	1824.0	3458.0	3648.0	700	1747.8	1842.8	3495.6	3685.6	793	1766.4	1861.4	3532.8	3722.8
513	1710.4	1805.4	3420.8	3610.8	607	1729.2	1824.2	3458.4	3648.4	701	1748.0	1843.0	3496.0	3686.0	794	1766.6	1861.6	3533.2	3723.2
514	1710.6	1805.6	3421.2	3611.2	608	1729.4	1824.4	3458.8	3648.8	702	1748.2	1843.2	3496.4	3686.4	795	1766.8	1861.8	3533.6	3723.6
515	1710.8	1805.8	3421.6	3611.6	609	1729.6	1824.6	3459.2	3649.2	703	1748.4	1843.4	3496.8	3686.8	796	1767.0	1862.0	3534.0	3724.0
516	1711.0	1806.0	3422.0	3612.0	610	1729.8	1824.8	3459.6	3649.6	704	1748.6	1843.6	3497.2	3687.2	797	1767.2	1862.2	3534.4	3724.4
517	1711.2	1806.2	3422.4	3612.4	611	1730.0	1825.0	3460.0	3650.0	705	1748.8	1843.8	3497.6	3687.6	798	1767.4	1862.4	3534.8	3724.8
518	1711.4	1806.4	3422.8	3612.8	612	1730.2	1825.2	3460.4	3650.4	706	1749.0	1844.0	3498.0	3688.0	799	1767.6	1862.6	3535.2	3725.2
519	1711.6	1806.6	3423.2	3613.2	613	1730.4	1825.4	3460.8	3650.8	707	1749.2	1844.2	3498.4	3688.4	800	1767.8	1862.8	3535.6	3725.6
520	1711.8	1806.8	3423.6	3613.6	614	1730.6	1825.6	3461.2	3651.2	708	1749.4	1844.4	3498.8	3688.8	801	1768.0	1863.0	3536.0	3726.0
521	1712.0	1807.0	3424.0	3614.0	615	1730.8	1825.8	3461.6	3651.6	709	1749.6	1844.6	3499.2	3689.2	802	1768.2	1863.2	3536.4	3726.4
522	1712.2	1807.2	3424.4	3614.4	616	1731.0	1826.0	3462.0	3652.0	710	1749.8	1844.8	3499.6	3689.6	803	1768.4	1863.4	3536.8	3726.8
523	1712.4	1807.4	3424.8	3614.8	617	1731.2	1826.2	3462.4	3652.4	711	1750.0	1845.0	3500.0	3690.0	804	1768.6	1863.6	3537.2	3727.2
524	1712.6	1807.6	3425.2	3615.2	618	1731.4	1826.4	3462.8	3652.8	712	1750.2	1845.2	3500.4	3690.4	805	1768.8	1863.8	3537.6	3727.6
525	1712.8	1807.8	3425.6	3615.6	619	1731.6	1826.6	3463.2	3653.2	713	1750.4	1845.4	3500.8	3690.8	806	1769.0	1864.0	3538.0	3728.0
526	1713.0	1808.0	3426.0	3616.0	620	1731.8	1826.8	3463.6	3653.6	714	1750.6	1845.6	3501.2	3691.2	807	1769.2	1864.2	3538.4	3728.4
527	1713.2	1808.2	3426.4	3616.4	621	1732.0	1827.0	3464.0	3654.0	715	1750.8	1845.8	3501.6	3691.6	808	1769.4	1864.4	3538.8	3728.8
528	1713.4	1808.4	3426.8	3616.8	622	1732.2	1827.2	3464.4	3654.4	716	1751.0	1846.0	3502.0	3692.0	809	1769.6	1864.6	3539.2	3729.2
529	1713.6	1808.6	3427.2	3617.2	623	1732.4	1827.4	3464.8	3654.8	717	1751.2	1846.2	3502.4	3692.4	810	1769.8	1864.8	3539.6	3729.6
530	1713.8	1808.8	3427.6	3617.6	624	1732.6	1827.6	3465.2	3655.2	718	1751.4	1846.4	3502.8	3692.8	811	1770.0	1865.0	3540.0	3730.0
531	1714.0	1809.0	3428.0	3618.0	625	1732.8	1827.8	3465.6	3655.6	719	1751.6	1846.6	3503.2	3693.2	812	1770.2	1865.2	3540.4	3730.4
532	1714.2	1809.2	3428.4	3618.4	626	1733.0	1828.0	3466.0	3656.0	720	1751.8	1846.8	3503.6	3693.6	813	1770.4	1865.4	3540.8	3730.8
533	1714.4	1809.4	3428.8	3618.8	627	1733.2	1828.2	3466.4	3656.4	721	1752.0	1847.0	3504.0	3694.0	814	1770.6	1865.6	3541.2	3731.2
534	1714.6	1809.6	3429.2	3619.2	628	1733.4	1828.4	3466.8	3656.8	722	1752.2	1847.2	3504.4	3694.4	815	1770.8	1865.8	3541.6	3731.6
535	1714.8	1809.8	3429.6	3619.6	629	1733.6	1828.6	3467.2	3657.2	723	1752.4	1847.4	3504.8	3694.8	816	1771.0	1866.0	3542.0	3732.0
536	1715.0	1810.0	3430.0	3620.0	630	1733.8	1828.8	3467.6	3657.6	724	1752.6	1847.6	3505.2	3695.2	817	1771.2	1866.2	3542.4	3732.4
537	1715.2	1810.2	3430.4	3620.4	631	1734.0	1829.0	3468.0	3658.0	725	1752.8	1847.8	3505.6	3695.6	818	1771.4	1866.4	3542.8	3732.8
538	1715.4	1810.4	3430.8	3620.8	632	1734.2	1829.2	3468.4	3658.4	726	1753.0	1848.0	3506.0	3696.0	819	1771.6	1866.6	3543.2	3733.2
539	1715.6	1810.6	3431.2	3621.2	633	1734.4	1829.4	3468.8	3658.8	727	1753.2	1848.2	3506.4	3696.4	820	1771.8	1866.8	3543.6	3733.6
540	1715.8	1810.8	3431.6	3621.6	634	1734.6	1829.6	3469.2	3659.2	728	1753.4	1848.4	3506.8	3696.8	821	1772.0	1867.0	3544.0	3734.0
541	1716.0	1811.0	3432.0	3622.0	635	1734.8	1829.8	3469.6	3659.6	729	1753.6	1848.6	3507.2	3697.2	822	1772.2	1867.2	3544.4	3734.4
542	1716.2	1811.2	3432.4	3622.4	636	1735.0	1830.0	3470.0	3660.0	730	1753.8	1848.8	3507.6	3697.6	823	1772.4	1867.4	3544.8	3734.8
543	1716.4	1811.4	3432.8	3622.8	637	1735.2	1830.2	3470.4	3660.4	731	1754.0	1849.0	3508.0	3698.0	824	1772.6	1867.6	3545.2	3735.2
544	1716.6	1811.6	3433.2	3623.2	638	1735.4	1830.4	3470.8	3660.8	732	1754.2	1849.2	3508.4	3698.4	825	1772.8	1867.8	3545.6	3735.6
545	1716.8	1811.8	3433.6	3623.6	639	1735.6	1830.6	3471.2	3661.2	733	1754.4	1849.4	3508.8	3698.8	826	1773.0	1868.0	3546.0	3736.0
546	1717.0	1812.0	3434.0	3624.0	640	1735.8	1830.8	3471.6	3661.6	734	1754.6	1849.6	3509.2	3699.2	827	1773.2	1868.2	3546.4	3736.4
547	1717.2	1812.2	3434.4	3624.4	641	1736.0	1831.0	3472.0	3662.0	735	1754.8	1849.8	3509.6	3699.6	828	1773.4	1868.4	3546.8	3736.8
548	1717.4	1812.4	3434.8	3624.8	642	1736.2	1831.2	3472.4	3662.4	736	1755.0	1850.0	3510.0	3700.0	829	1773.6	1868.6	3547.2	3737.2
549	1717.6	1812.6	3435.2	3625.2	643	1736.4	1831.4	3472.8	3662.8	737	1755.2	1850.2	3510.4	3700.4	830	1773.8	1868.8	3547.6	3737.6
550	1717.8	1812.8	3435.6	3625.6	644	1736.6	1831.6	3473.2	3663.2	738	1755.4	1850.4	3510.8	3700.8	831	1774.0	1869.0	3548.0	3738.0
551	1718.0	1813.0	3436.0	3626.0	645	1736.8	1831.8	3473.6	3663.6	739	1755.6	1850.6	3511.2	3701.2	832	1774.2	1869.2	3548.4	3738.4
552	1718.2	1813.2	3436.4	3626.4	646	1737.0	1832.0	3474.0	3664.0	740	1755.8	1850.8	3511.6	3701.6	833	1774.4	1869.4	3548.8	3738.8
553	1718.4	1813.4	3436.8	3626.8	647	1737.2	1832.2	3474.4	3664.4	741	1756.0	1851.0	3512.0	3702.0	834	1774.6	1869.6	3549.2	3739.2
554	1718.6	1813.6	3437.2	3627.2	648	1737.4	1832.4	3474.8	3664.8	742	1756.2	1851.2	3512.4	3702.4	835	1774.8	1869.8	3549.6	3739.6
555	1718.8	1813.8	3437.6	3627.6	649	1737.6	1832.6	3475.2	3665.2	743	1756.4	1851.4	3512.8	3702.8	836	1775.0	1870.0	3550.0	3740.0
556	1719.0	1814.0	3438.0	3628.0	650	1737.8	1832.8	3475.6	3665.6	744	1756.6	1851.6	3513.2	3703.2	837	1775.2	1870.2	3550.4	3740.4
557	1719.2	1814.2	3438.4	3628.4	651	1738.0	1833.0	3476.0	3666.0	745	1756.8	1851.8	3513.6	3703.6	838	1775.4	1870.4	3550.8	3740.8
558	1719.4	1814.4	3438.8	3628.8	652	1738.2	1833.2	3476.4	3666.4	746	1757.0	1852.0	3514.0	3704.0	839	1775.6	1870.6	3551.2	3741.2
559	1719.6	1814.6	3439.2	3629.2	653	1738.4	1833.4	3476.8	3666.8	747	1757.2	1852.2	3514.4	3704.4	840	1775.8	1870.8	3551.6	3741.6
560	1719.8	1814.8	3439.6	3629.6	654	1738.6	1833.6	3477.2	3667.2	748	1757.4	1852.4	3514.8	3704.8	841	1776.0	1871.0	3552.0	3742.0
561	1720.0	1815.0	3440.0	3630.0	655	1738.8	1833.8	3477.6	3667.6	749	1757.6	1852.6	3515.2	3705.2	842	1776.2	1871.2	3552.4	3742.4
562	1720.2	1815.2	3440.4	3630.4	656	1739.0	1834.0	3478.0	3668.0	750	1757.8	1852.8	3515.6	3705.6	843	1776.4	1871.4	3552.8	3742.8
563	1720.4	1815.4	3440.8	3630.8	657	1739.2	1834.2	3478.4	3668.4	751	1758.0	1853.0	3516.0	3706.0	844	1776.6	1871.6	3553.2	3743.2
564	1720.6	1815.6	3441.2	3631.2	658	1739.4	1834.4	3478.8	3668.8	752	1758.2	1853.2	3516.4	3706.4	845	1776.8	1871.8	3553.6	3743.6
565	1720.8	1815.8	3441.6	3631.6	659	1739.6	1834.6	3479.2	3669.2	753	1758.4	1853.4	3516.8	3706.8	846	1777.0	1872.0	3554.0	3744.0
566	1721.0	1816.0	3442.0	3632.0	660	1739.8	1834.8	3479.6	3669.6	754	1758.6	1853.6	3517.2	3707.2	847	1777.2	1872.2	3554.4	3744.4
567	1721.2	1816.2	3442.4	3632.4	661	1740.0	1835.0	3480.0	3670.0	755	1758.8	1853.8	3517.6	3707.6	848	1777.4	1872.4	3554.8	3744.8
568	1721.4	1816.4	3442.8	3632.8	662	1740.2	1835.2	3480.4	3670.4	756	1759.0	1854.0	3518.0	3708.0	849	1777.6	1872.6	3555.2	3745.2
569	1721.6	1816.6	3443.2	3633.2	663	1740.4	1835.4	3480.8	3670.8	757	1759.2	1854.2	3518.4	3708.4	850	1777.8	1872.8	3555.6	3745.6
570	1721.8	1816.8	3443.6	3633.6	664	1740.6	1835.6	3481.2	3671.2	758	1759.4	1854.4	3518.8	3708.8	851	1778.0	1873.0	3556.0	3746.0
571	1722.0	1817.0	3444.0	3634.0	665	1740.8	1835.8	3481.6	3671.6	759	1759.6	1854.6	3519.2	3709.2	852	1778.2	1873.2	3556.4	3746.4
572	1722.2	1817.2	3444.4	3634.4	666	1741.0	1836.0	3482.0	3672.0	760	1759.8	1854.8	3519.6	3709.6	853	1778.4	1873.4	3556.8	3746.8
573	1722.4	1817.4	3444.8	3634.8	667	1741.2	1836.2	3482.4	3672.4	761	1760.0	1855.0	3520.0	3710.0	854	1778.6	1873.6	3557.2	3747.2
574	1722.6	1817.6	3445.2	3635.2	668	1741.4	1836.4	3482.8	3672.8	762	1760.2	1855.2	3520.4	3710.4	855	1778.8	1873.8	3557.6	3747.6
575	1722.8	1817.8	3445.6	3635.6	669	1741.6	1836.6	3483.2	3673.2	763	1760.4	1855.4	3520.8	3710.8	856	1779.0	1874.0	3558.0	3748.0
576	1723.0	1818.0	3446.0	3636.0	670	1741.8	1836.8	3483.6	3673.6	764	1760.6	1855.6	3521.2	3711.2	857	1779.2	1874.2	3558.4	3748.4
577	1723.2	1818.2	3446.4	3636.4	671	1742.0	1837.0	3484.0	3674.0	765	1760.8	1855.8	3521.6	3711.6	858	1779.4	1874.4	3558.8	3748.8
578	1723.4	1818.4	3446.8	3636.8	672	1742.2	1837.2	3484.4	3674.4	766	1761.0	1856.0	3522.0	3712.0	859	1779.6	1874.6	3559.2	3749.2
579	1723.6	1818.6	3447.2	3637.2	673	1742.4	1837.4	3484.8	3674.8	767	1761.2	1856.2	3522.4	3712.4	860	1779.8	1874.8	3559.6	3749.6
580	1723.8	1818.8	3447.6	3637.6	674	1742.6	1837.6	3485.2	3675.2	768	1761.4	1856.4	3522.8	3712.8	861	1780.0	1875.0	3560.0	3750.0
581	1724.0	1819.0	3448.0	3638.0	675	1742.8	1837.8	3485.6	3675.6	769	1761.6	1856.6	3523.2	3713.2	862	1780.2	1875.2	3560.4	3750.4
582	1724.2	1819.2	3448.4	3638.4	676	1743.0	1838.0	3486.0	3676.0	770	1761.8	1856.8	3523.6	3713.6	863	1780.4	1875.4	3560.8	3750.8
583	1724.4	1819.4	3448.8	3638.8	677	1743.2	1838.2	3486.4	3676.4	771	1762.0	1857.0	3524.0	3714.0	864	1780.6	1875.6	3561.2	3751.2
584	1724.6	1819.6	3449.2	3639.2	678	1743.4	1838.4	3486.8	3676.8	772	1762.2	1857.2	3524.4	3714.4	865	1780.8	1875.8	3561.6	3751.6
585	1724.8	1819.8	3449.6	3639.6	679	1743.6	1838.6	3487.2	3677.2	773	1762.4	1857.4	3524.8	3714.8	866	1781.0	1876.0	3562.0	3752.0
586	1725.0	1820.0	3450.0	3640.0	680	1743.8	1838.8	3487.6	3677.6	774	1762.6	1857.6	3525.2	3715.2	867	1781.2	1876.2	3562.4	3752.4
587	1725.2	1820.2	3450.4	3640.4	681	1744.0	1839.0	3488.0	3678.0	775	1762.8	1857.8	3525.6	3715.6	868	1781.4	1876.4	3562.8	3752.8
588	1725.4	1820.4	3450.8	3640.8	682	1744.2	1839.2	3488.4	3678.4	776	1763.0	1858.0	3526.0	3716.0	869	1781.6	1876.6	3563.2	3753.2
589	1725.6	1820.6	3451.2	3641.2	683	1744.4	1839.4	3488.8	3678.8	777	1763.2	1858.2	3526.4	3716.4	870	1781.8	1876.8	3563.6	3753.6
590	1725.8	1820.8	3451.6	3641.6	684	1744.6	1839.6	3489.2	3679.2	778	1763.4	1858.4	3526.8	3716.8	871	1782.0	1877.0	3564.0	3754.0
591	1726.0	1821.0	3452.0	3642.0	685	1744.8	1839.8	3489.6	3679.6	779	1763.6	1858.6	3527.2	3717.2	872	1782.2	1877.2	3564.4	3754.4
592	1726.2	1821.2	3452.4	3642.4	686	1745.0	1840.0	3490.0	3680.0	780	1763.8	1858.8	3527.6	3717.6	873	1782.4	1877.4	3564.8	3754.8
593	1726.4	1821.4	3452.8	3642.8	687	1745.2	1840.2	3490.4	3680.4	781	1764.0	1859.0	3528.0	3718.0	874	1782.6	1877.6	3565.2	3755.2
594	1726.6	1821.6	3453.2	3643.2	688	1745.4	1840.4	3490.8	3680.8	782	1764.2	1859.2	3528.4	3718.4	875	1782.8	1877.8	3565.6	3755.6
595	1726.8	1821.8	3453.6	3643.6	689	1745.6	1840.6	3491.2	3681.2	783	1764.4	1859.4	3528.8	3718.8	876	1783.0	1878.0	3566.0	3756.0
596	1727.0	1822.0	3454.0	3644.0	690	1745.8	1840.8	3491.6	3681.6	784	1764.6	1859.6	3529.2	3719.2	877	1783.2	1878.2	3566.4	3756.4
597	1727.2	1822.2	3454.4	3644.4	691	1746.0	1841.0	3492.0	3682.0	785	1764.8	1859.8	3529.6	3719.6	878	1783.4	1878.4	3566.8	3756.8
598	1727.4	1822.4	3454.8	3644.8	692	1746.2	1841.2	3492.4	3682.4	786	1765.0	1860.0	3530.0	3720.0	879	1783.6	1878.6	3567.2	3757.2
599	1727.6	1822.6	3455.2	3645.2	693	1746.4	1841.4	3492.8	3682.8	787	1765.2	1860.2	3530.4	3720.4	880	1783.8	1878.8	3567.6	3757.6
600	1727.8	1822.8	3455.6	3645.6	694	1746.6	1841.6	3493.2	3683.2	788	1765.4	1860.4	3530.8	3720.8	881	1784.0	1879.0	3568.0	3758.0
601	1728.0	1823.0	3456.0	3646.0	695	1746.8	1841.8	3493.6	3683.6	789	1765.6	1860.6	3531.2	3721.2	882	1784.2	1879.2	3568.4	3758.4
602	1728.2	1823.2	3456.4	3646.4	696	1747.0	1842.0	3494.0	3684.0	790	1765.8	1860.8	3531.6	3721.6	883	1784.4	1879.4	3568.8	3758.8
603	1728.4	1823.4	3456.8	3646.8	697	1747.2	1842.2	3494.4	3684.4	791	1766.0	1861.0	3532.0	3722.0	884	1784.6	1879.6	3569.2	3759.2
604	1728.6	1823.6	3457.2	3647.2	698	1747.4	1842.4	3494.8	3684.8	792	1766.2	1861.2	3532.4	3722.4	885	1784.8	1879.8	3569.6	3759.6
605	1728.8	1823.8	3457.6	3647.6	699	1747.6	1842.6	3495.2	3685.2										

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GSM1900 frequencies

CH	TX	RX	VCO TX	VCO RX	CH	TX	RX	VCO TX	VCO RX	CH	TX	RX	VCO TX	VCO RX	CH	TX	RX	VCO TX	VCO RX
512	1850,2	1930,2	3700,4	3860,4	606	1869,0	1949,0	3738,0	3898,0	700	1887,8	1967,8	3775,6	3935,6	794	1906,6	1986,6	3813,2	3973,2
513	1850,4	1930,4	3700,8	3860,8	607	1869,2	1949,2	3738,4	3898,4	701	1888,0	1968,0	3776,0	3936,0	795	1906,8	1986,8	3813,6	3973,6
514	1850,6	1930,6	3701,2	3861,2	608	1869,4	1949,4	3738,8	3898,8	702	1888,2	1968,2	3776,4	3936,4	796	1907,0	1987,0	3814,0	3974,0
515	1850,8	1930,8	3701,6	3861,6	609	1869,6	1949,6	3739,2	3899,2	703	1888,4	1968,4	3776,8	3936,8	797	1907,2	1987,2	3814,4	3974,4
516	1851,0	1931,0	3702,0	3862,0	610	1869,8	1949,8	3739,6	3899,6	704	1888,6	1968,6	3777,2	3937,2	798	1907,4	1987,4	3814,8	3974,8
517	1851,2	1931,2	3702,4	3862,4	611	1870,0	1950,0	3740,0	3900,0	705	1888,8	1968,8	3777,6	3937,6	799	1907,6	1987,6	3815,2	3975,2
518	1851,4	1931,4	3702,8	3862,8	612	1870,2	1950,2	3740,4	3900,4	706	1889,0	1969,0	3778,0	3938,0	800	1907,8	1987,8	3815,6	3975,6
519	1851,6	1931,6	3703,2	3863,2	613	1870,4	1950,4	3740,8	3900,8	707	1889,2	1969,2	3778,4	3938,4	801	1908,0	1988,0	3816,0	3976,0
520	1851,8	1931,8	3703,6	3863,6	614	1870,6	1950,6	3741,2	3901,2	708	1889,4	1969,4	3778,8	3938,8	802	1908,2	1988,2	3816,4	3976,4
521	1852,0	1932,0	3704,0	3864,0	615	1870,8	1950,8	3741,6	3901,6	709	1889,6	1969,6	3779,2	3939,2	803	1908,4	1988,4	3816,8	3976,8
522	1852,2	1932,2	3704,4	3864,4	616	1871,0	1951,0	3742,0	3902,0	710	1889,8	1969,8	3779,6	3939,6	804	1908,6	1988,6	3817,2	3977,2
523	1852,4	1932,4	3704,8	3864,8	617	1871,2	1951,2	3742,4	3902,4	711	1890,0	1970,0	3780,0	3940,0	805	1908,8	1988,8	3817,6	3977,6
524	1852,6	1932,6	3705,2	3865,2	618	1871,4	1951,4	3742,8	3902,8	712	1890,2	1970,2	3780,4	3940,4	806	1909,0	1989,0	3818,0	3978,0
525	1852,8	1932,8	3705,6	3865,6	619	1871,6	1951,6	3743,2	3903,2	713	1890,4	1970,4	3780,8	3940,8	807	1909,2	1989,2	3818,4	3978,4
526	1853,0	1933,0	3706,0	3866,0	620	1871,8	1951,8	3743,6	3903,6	714	1890,6	1970,6	3781,2	3941,2	808	1909,4	1989,4	3818,8	3978,8
527	1853,2	1933,2	3706,4	3866,4	621	1872,0	1952,0	3744,0	3904,0	715	1890,8	1970,8	3781,6	3941,6	809	1909,6	1989,6	3819,2	3979,2
528	1853,4	1933,4	3706,8	3866,8	622	1872,2	1952,2	3744,4	3904,4	716	1891,0	1971,0	3782,0	3942,0	810	1909,8	1989,8	3819,6	3979,6
529	1853,6	1933,6	3707,2	3867,2	623	1872,4	1952,4	3744,8	3904,8	717	1891,2	1971,2	3782,4	3942,4					
530	1853,8	1933,8	3707,6	3867,6	624	1872,6	1952,6	3745,2	3905,2	718	1891,4	1971,4	3782,8	3942,8					
531	1854,0	1934,0	3708,0	3868,0	625	1872,8	1952,8	3745,6	3905,6	719	1891,6	1971,6	3783,2	3943,2					
532	1854,2	1934,2	3708,4	3868,4	626	1873,0	1953,0	3746,0	3906,0	720	1891,8	1971,8	3783,6	3943,6					
533	1854,4	1934,4	3708,8	3868,8	627	1873,2	1953,2	3746,4	3906,4	721	1892,0	1972,0	3784,0	3944,0					
534	1854,6	1934,6	3709,2	3869,2	628	1873,4	1953,4	3746,8	3906,8	722	1892,2	1972,2	3784,4	3944,4					
535	1854,8	1934,8	3709,6	3869,6	629	1873,6	1953,6	3747,2	3907,2	723	1892,4	1972,4	3784,8	3944,8					
536	1855,0	1935,0	3710,0	3870,0	630	1873,8	1953,8	3747,6	3907,6	724	1892,6	1972,6	3785,2	3945,2					
537	1855,2	1935,2	3710,4	3870,4	631	1874,0	1954,0	3748,0	3908,0	725	1892,8	1972,8	3785,6	3945,6					
538	1855,4	1935,4	3710,8	3870,8	632	1874,2	1954,2	3748,4	3908,4	726	1893,0	1973,0	3786,0	3946,0					
539	1855,6	1935,6	3711,2	3871,2	633	1874,4	1954,4	3748,8	3908,8	727	1893,2	1973,2	3786,4	3946,4					
540	1855,8	1935,8	3711,6	3871,6	634	1874,6	1954,6	3749,2	3909,2	728	1893,4	1973,4	3786,8	3946,8					
541	1856,0	1936,0	3712,0	3872,0	635	1874,8	1954,8	3749,6	3909,6	729	1893,6	1973,6	3787,2	3947,2					
542	1856,2	1936,2	3712,4	3872,4	636	1875,0	1955,0	3750,0	3910,0	730	1893,8	1973,8	3787,6	3947,6					
543	1856,4	1936,4	3712,8	3872,8	637	1875,2	1955,2	3750,4	3910,4	731	1894,0	1974,0	3788,0	3948,0					
544	1856,6	1936,6	3713,2	3873,2	638	1875,4	1955,4	3750,8	3910,8	732	1894,2	1974,2	3788,4	3948,4					
545	1856,8	1936,8	3713,6	3873,6	639	1875,6	1955,6	3751,2	3911,2	733	1894,4	1974,4	3788,8	3948,8					
546	1857,0	1937,0	3714,0	3874,0	640	1875,8	1955,8	3751,6	3911,6	734	1894,6	1974,6	3789,2	3949,2					
547	1857,2	1937,2	3714,4	3874,4	641	1876,0	1956,0	3752,0	3912,0	735	1894,8	1974,8	3789,6	3949,6					
548	1857,4	1937,4	3714,8	3874,8	642	1876,2	1956,2	3752,4	3912,4	736	1895,0	1975,0	3790,0	3950,0					
549	1857,6	1937,6	3715,2	3875,2	643	1876,4	1956,4	3752,8	3912,8	737	1895,2	1975,2	3790,4	3950,4					
550	1857,8	1937,8	3715,6	3875,6	644	1876,6	1956,6	3753,2	3913,2	738	1895,4	1975,4	3790,8	3950,8					
551	1858,0	1938,0	3716,0	3876,0	645	1876,8	1956,8	3753,6	3913,6	739	1895,6	1975,6	3791,2	3951,2					
552	1858,2	1938,2	3716,4	3876,4	646	1877,0	1957,0	3754,0	3914,0	740	1895,8	1975,8	3791,6	3951,6					
553	1858,4	1938,4	3716,8	3876,8	647	1877,2	1957,2	3754,4	3914,4	741	1896,0	1976,0	3792,0	3952,0					
554	1858,6	1938,6	3717,2	3877,2	648	1877,4	1957,4	3754,8	3914,8	742	1896,2	1976,2	3792,4	3952,4					
555	1858,8	1938,8	3717,6	3877,6	649	1877,6	1957,6	3755,2	3915,2	743	1896,4	1976,4	3792,8	3952,8					
556	1859,0	1939,0	3718,0	3878,0	650	1877,8	1957,8	3755,6	3915,6	744	1896,6	1976,6	3793,2	3953,2					
557	1859,2	1939,2	3718,4	3878,4	651	1878,0	1958,0	3756,0	3916,0	745	1896,8	1976,8	3793,6	3953,6					
558	1859,4	1939,4	3718,8	3878,8	652	1878,2	1958,2	3756,4	3916,4	746	1897,0	1977,0	3794,0	3954,0					
559	1859,6	1939,6	3719,2	3879,2	653	1878,4	1958,4	3756,8	3916,8	747	1897,2	1977,2	3794,4	3954,4					
560	1859,8	1939,8	3719,6	3879,6	654	1878,6	1958,6	3757,2	3917,2	748	1897,4	1977,4	3794,8	3954,8					
561	1860,0	1940,0	3720,0	3880,0	655	1878,8	1958,8	3757,6	3917,6	749	1897,6	1977,6	3795,2	3955,2					
562	1860,2	1940,2	3720,4	3880,4	656	1879,0	1959,0	3758,0	3918,0	750	1897,8	1977,8	3795,6	3955,6					
563	1860,4	1940,4	3720,8	3880,8	657	1879,2	1959,2	3758,4	3918,4	751	1898,0	1978,0	3796,0	3956,0					
564	1860,6	1940,6	3721,2	3881,2	658	1879,4	1959,4	3758,8	3918,8	752	1898,2	1978,2	3796,4	3956,4					
565	1860,8	1940,8	3721,6	3881,6	659	1879,6	1959,6	3759,2	3919,2	753	1898,4	1978,4	3796,8	3956,8					
566	1861,0	1941,0	3722,0	3882,0	660	1879,8	1959,8	3759,6	3919,6	754	1898,6	1978,6	3797,2	3957,2					
567	1861,2	1941,2	3722,4	3882,4	661	1880,0	1960,0	3760,0	3920,0	755	1898,8	1978,8	3797,6	3957,6					
568	1861,4	1941,4	3722,8	3882,8	662	1880,2	1960,2	3760,4	3920,4	756	1899,0	1979,0	3798,0	3958,0					
569	1861,6	1941,6	3723,2	3883,2	663	1880,4	1960,4	3760,8	3920,8	757	1899,2	1979,2	3798,4	3958,4					
570	1861,8	1941,8	3723,6	3883,6	664	1880,6	1960,6	3761,2	3921,2	758	1899,4	1979,4	3798,8	3958,8					
571	1862,0	1942,0	3724,0	3884,0	665	1880,8	1960,8	3761,6	3921,6	759	1899,6	1979,6	3799,2	3959,2					
572	1862,2	1942,2	3724,4	3884,4	666	1881,0	1961,0	3762,0	3922,0	760	1899,8	1979,8	3799,6	3959,6					
573	1862,4	1942,4	3724,8	3884,8	667	1881,2	1961,2	3762,4	3922,4	761	1900,0	1980,0	3800,0	3960,0					
574	1862,6	1942,6	3725,2	3885,2	668	1881,4	1961,4	3762,8	3922,8	762	1900,2	1980,2	3800,4	3960,4					
575	1862,8	1942,8	3725,6	3885,6	669	1881,6	1961,6	3763,2	3923,2	763	1900,4	1980,4	3800,8	3960,8					
576	1863,0	1943,0	3726,0	3886,0	670	1881,8	1961,8	3763,6	3923,6	764	1900,6	1980,6	3801,2	3961,2					
577	1863,2	1943,2	3726,4	3886,4	671	1882,0	1962,0	3764,0	3924,0	765	1900,8	1980,8	3801,6	3961,6					
578	1863,4	1943,4	3726,8	3886,8	672	1882,2	1962,2	3764,4	3924,4	766	1901,0	1981,0	3802,0	3962,0					
579	1863,6	1943,6	3727,2	3887,2	673	1882,4	1962,4	3764,8	3924,8	767	1901,2	1981,2	3802,4	3962,4					
580	1863,8	1943,8	3727,6	3887,6	674	1882,6	1962,6	3765,2	3925,2	768	1901,4	1981,4	3802,8	3962,8					
581	1864,0	1944,0	3728,0	3888,0	675	1882,8	1962,8	3765,6	3925,6	769	1901,6	1981,6	3803,2	3963,2					
582	1864,2	1944,2	3728,4	3888,4	676	1883,0	1963,0	3766,0	3926,0	770	1901,8	1981,8	3803,6	3963,6					
583	1864,4	1944,4	3728,8	3888,8	677	1883,2	1963,2	3766,4	3926,4	771	1902,0	1982,0	3804,0	3964,0					
584	1864,6	1944,6	3729,2	3889,2	678	1883,4	1963,4	3766,8	3926,8	772	1902,2	1982,2	3804,4	3964,4					
585	1864,8	1944,8	3729,6	3889,6	679	1883,6	1963,6	3767,2	3927,2	773	1902,4	1982,4	3804,8	3964,8					
586	1865,0	1945,0	3730,0	3890,0	680	1883,8	1963,8	3767,6	3927,6	774	1902,6	1982,6	3805,2	3965,2					
587	1865,2	1945,2	3730,4	3890,4	681	1884,0	1964,0	3768,0	3928,0	775	1902,8	1982,8	3805,6	3965,6					
588	1865,4	1945,4	3730,8	3890,8	682	1884,2	1964,2	3768,4	3928,4	776	1903,0	1983,0	3806,0	3966,0					
589	1865,6	1945,6	3731,2	3891,2	683	1884,4	1964,4	3768,8	3928,8	777	1903,2	1983,2	3806,4	3966,4					
590	1865,8	1945,8	3731,6	3891,6	684	1884,6	1964,6	3769,2	3929,2	778	1903,4	1983,4	3806,8	3966,8					
591	1866,0	1946,0	3732,0	3892,0	685	1884,8	1964,8	3769,6	3929,6	779	1903,6	1983,6	3807,2	3967,2					
592	1866,2	1946,2	3732,4	3892,4	686	1885,0	1965,0	3770,0	3930,0	780	1903,8	1983,8	3807,6	3967,6					
593	1866,4	1946,4	3732,8	3892,8	687	1885,2	1965,2	3770,4	3930,4	781	1904,0	1984,0	3808,0	3968,0					
594	1866,6	1946,6	3733,2	3893,2	688	1885,4	1965,4	3770,8	3930,8	782	1904,2	1984,2	3808,4	3968,4					
595	1866,8	1946,8	3733,6	3893,6	689	1885,6	1965,6	3771,2	3931,2	783	1904,4	1984,4	3808,8	3968,8					
596	1867,0	1947,0	3734,0	3894,0	690	1885,8	1965,8	3771,6	3931,6	784	1904,6	1984,6	3809,2	3969,2					
597	1867,2	1947,2	3734,4	3894,4	691	1886,0	1966,0	3772,0	3932,0	785	1904,8	1984,8	3809,6	3969,6					
598	1867,4	1947,4	3734,8	3894,8	692	1886,2	1966,2	3772,4	3932,4	786	1905,0	1985,0	3810,0	3970,0					
599	1867,6	1947,6	3735,2	3895,2	693	1886,4	1966,4	3772,8	3932,8	787	1905,2	1985,2	3810,4	3970,4					
600	1867,8	1947,8	3735,6	3895,6	694	1886,6	1966,6	3773,2	3933,2	788	1905,4	1985,4	3810,8	3970,8					
601	1868,0	1948,0	3736,0	3896,0	695	1886,8	1966,8	3773,6	3933,6	789	1905,6	1985,6	3811,2	3971,2					
602	1868,2	1948,2	3736,4	3896,4	696	1887,0	1967,0	3774,0	3934,0	790	1905,8	1985,8	3811,6	3971,6					
603	1868,4	1948,4	3736,8	3896,8	697	1887,2	1967,2	3774,4	3934,4	791	1906,0	1986,0	3812,0	3972,0					
604	1868,6	1948,6	3737,2	3897,2	698	1887,4	1967,4	3774,8	3934,8	792	1906,2	1986,2	3812,4	3972,4					
605	1868,8	1948,8	3737,6	3897,6	699	1887,6	1967,6	3775,2	3935,2	793	1906,4	1986,4	3812,8	3972,8					

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WCDMA 2100 Rx frequencies

Ch	RX	VCO RX	Ch	RX	VCO RX	Ch	RX	VCO RX	Ch	RX	VCO RX	Ch	RX	VCO RX
10562	2112.4	4224.8	10625	2125	4250	10688	2137.6	4275.2	10751	2150.2	4300.4	10814	2162.8	4325.6
10563	2112.6	4225.2	10626	2125.2	4250.4	10689	2137.8	4275.6	10752	2150.4	4300.8	10815	2163	4326
10564	2112.8	4225.6	10627	2125.4	4250.8	10690	2138	4276	10753	2150.6	4301.2	10816	2163.2	4326.4
10565	2113	4226	10628	2125.6	4251.2	10691	2138.2	4276.4	10754	2150.8	4301.6	10817	2163.4	4326.8
10566	2113.2	4226.4	10629	2125.8	4251.6	10692	2138.4	4276.8	10755	2151	4302	10818	2163.6	4327.2
10567	2113.4	4226.8	10630	2126	4252	10693	2138.6	4277.2	10756	2151.2	4302.4	10819	2163.8	4327.6
10568	2113.6	4227.2	10631	2126.2	4252.4	10694	2138.8	4277.6	10757	2151.4	4302.8	10820	2164	4328
10569	2113.8	4227.6	10632	2126.4	4252.8	10695	2139	4278	10758	2151.6	4303.2	10821	2164.2	4328.4
10570	2114	4228	10633	2126.6	4253.2	10696	2139.2	4278.4	10759	2151.8	4303.6	10822	2164.4	4328.8
10571	2114.2	4228.4	10634	2126.8	4253.6	10697	2139.4	4278.8	10760	2152	4304	10823	2164.6	4329.2
10572	2114.4	4228.8	10635	2127	4254	10698	2139.6	4279.2	10761	2152.2	4304.4	10824	2164.8	4329.6
10573	2114.6	4229.2	10636	2127.2	4254.4	10699	2139.8	4279.6	10762	2152.4	4304.8	10825	2165	4330
10574	2114.8	4229.6	10637	2127.4	4254.8	10700	2140	4280	10763	2152.6	4305.2	10826	2165.2	4330.4
10575	2115	4230	10638	2127.6	4255.2	10701	2140.2	4280.4	10764	2152.8	4305.6	10827	2165.4	4330.8
10576	2115.2	4230.4	10639	2127.8	4255.6	10702	2140.4	4280.8	10765	2153	4306	10828	2165.6	4331.2
10577	2115.4	4230.8	10640	2128	4256	10703	2140.6	4281.2	10766	2153.2	4306.4	10829	2165.8	4331.6
10578	2115.6	4231.2	10641	2128.2	4256.4	10704	2140.8	4281.6	10767	2153.4	4306.8	10830	2166	4332
10579	2115.8	4231.6	10642	2128.4	4256.8	10705	2141	4282	10768	2153.6	4307.2	10831	2166.2	4332.4
10580	2116	4232	10643	2128.6	4257.2	10706	2141.2	4282.4	10769	2153.8	4307.6	10832	2166.4	4332.8
10581	2116.2	4232.4	10644	2128.8	4257.6	10707	2141.4	4282.8	10770	2154	4308	10833	2166.6	4333.2
10582	2116.4	4232.8	10645	2129	4258	10708	2141.6	4283.2	10771	2154.2	4308.4	10834	2166.8	4333.6
10583	2116.6	4233.2	10646	2129.2	4258.4	10709	2141.8	4283.6	10772	2154.4	4308.8	10835	2167	4334
10584	2116.8	4233.6	10647	2129.4	4258.8	10710	2142	4284	10773	2154.6	4309.2	10836	2167.2	4334.4
10585	2117	4234	10648	2129.6	4259.2	10711	2142.2	4284.4	10774	2154.8	4309.6	10837	2167.4	4334.8
10586	2117.2	4234.4	10649	2129.8	4259.6	10712	2142.4	4284.8	10775	2155	4310	10838	2167.6	4335.2
10587	2117.4	4234.8	10650	2130	4260	10713	2142.6	4285.2	10776	2155.2	4310.4			
10588	2117.6	4235.2	10651	2130.2	4260.4	10714	2142.8	4285.6	10777	2155.4	4310.8			
10589	2117.8	4235.6	10652	2130.4	4260.8	10715	2143	4286	10778	2155.6	4311.2			
10590	2118	4236	10653	2130.6	4261.2	10716	2143.2	4286.4	10779	2155.8	4311.6			
10591	2118.2	4236.4	10654	2130.8	4261.6	10717	2143.4	4286.8	10780	2156	4312			
10592	2118.4	4236.8	10655	2131	4262	10718	2143.6	4287.2	10781	2156.2	4312.4			
10593	2118.6	4237.2	10656	2131.2	4262.4	10719	2143.8	4287.6	10782	2156.4	4312.8			
10594	2118.8	4237.6	10657	2131.4	4262.8	10720	2144	4288	10783	2156.6	4313.2			
10595	2119	4238	10658	2131.6	4263.2	10721	2144.2	4288.4	10784	2156.8	4313.6			
10596	2119.2	4238.4	10659	2131.8	4263.6	10722	2144.4	4288.8	10785	2157	4314			
10597	2119.4	4238.8	10660	2132	4264	10723	2144.6	4289.2	10786	2157.2	4314.4			
10598	2119.6	4239.2	10661	2132.2	4264.4	10724	2144.8	4289.6	10787	2157.4	4314.8			
10599	2119.8	4239.6	10662	2132.4	4264.8	10725	2145	4290	10788	2157.6	4315.2			
10600	2120	4240	10663	2132.6	4265.2	10726	2145.2	4290.4	10789	2157.8	4315.6			
10601	2120.2	4240.4	10664	2132.8	4265.6	10727	2145.4	4290.8	10790	2158	4316			
10602	2120.4	4240.8	10665	2133	4266	10728	2145.6	4291.2	10791	2158.2	4316.4			
10603	2120.6	4241.2	10666	2133.2	4266.4	10729	2145.8	4291.6	10792	2158.4	4316.8			
10604	2120.8	4241.6	10667	2133.4	4266.8	10730	2146	4292	10793	2158.6	4317.2			
10605	2121	4242	10668	2133.6	4267.2	10731	2146.2	4292.4	10794	2158.8	4317.6			
10606	2121.2	4242.4	10669	2133.8	4267.6	10732	2146.4	4292.8	10795	2159	4318			
10607	2121.4	4242.8	10670	2134	4268	10733	2146.6	4293.2	10796	2159.2	4318.4			
10608	2121.6	4243.2	10671	2134.2	4268.4	10734	2146.8	4293.6	10797	2159.4	4318.8			
10609	2121.8	4243.6	10672	2134.4	4268.8	10735	2147	4294	10798	2159.6	4319.2			
10610	2122	4244	10673	2134.6	4269.2	10736	2147.2	4294.4	10799	2159.8	4319.6			
10611	2122.2	4244.4	10674	2134.8	4269.6	10737	2147.4	4294.8	10800	2160	4320			
10612	2122.4	4244.8	10675	2135	4270	10738	2147.6	4295.2	10801	2160.2	4320.4			
10613	2122.6	4245.2	10676	2135.2	4270.4	10739	2147.8	4295.6	10802	2160.4	4320.8			
10614	2122.8	4245.6	10677	2135.4	4270.8	10740	2148	4296	10803	2160.6	4321.2			
10615	2123	4246	10678	2135.6	4271.2	10741	2148.2	4296.4	10804	2160.8	4321.6			
10616	2123.2	4246.4	10679	2135.8	4271.6	10742	2148.4	4296.8	10805	2161	4322			
10617	2123.4	4246.8	10680	2136	4272	10743	2148.6	4297.2	10806	2161.2	4322.4			
10618	2123.6	4247.2	10681	2136.2	4272.4	10744	2148.8	4297.6	10807	2161.4	4322.8			
10619	2123.8	4247.6	10682	2136.4	4272.8	10745	2149	4298	10808	2161.6	4323.2			
10620	2124	4248	10683	2136.6	4273.2	10746	2149.2	4298.4	10809	2161.8	4323.6			
10621	2124.2	4248.4	10684	2136.8	4273.6	10747	2149.4	4298.8	10810	2162	4324			
10622	2124.4	4248.8	10685	2137	4274	10748	2149.6	4299.2	10811	2162.2	4324.4			
10623	2124.6	4249.2	10686	2137.2	4274.4	10749	2149.8	4299.6	10812	2162.4	4324.8			
10624	2124.8	4249.6	10687	2137.4	4274.8	10750	2150	4300	10813	2162.6	4325.2			

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WCDMA 2100 Tx frequencies

Ch	Tx	VCO Tx	Ch	Tx	VCO Tx	Ch	Tx	VCO Tx	Ch	Tx	VCO Tx	Ch	Tx	VCO Tx
9612	1922.4	3844.8	9671	1934.2	3868.4	9730	1946	3892	9789	1957.8	3915.6	9848	1969.6	3939.2
9613	1922.6	3845.2	9672	1934.4	3868.8	9731	1946.2	3892.4	9790	1958	3916	9849	1969.8	3939.6
9614	1922.8	3845.6	9673	1934.6	3869.2	9732	1946.4	3892.8	9791	1958.2	3916.4	9850	1970	3940
9615	1923	3846	9674	1934.8	3869.6	9733	1946.6	3893.2	9792	1958.4	3916.8	9851	1970.2	3940.4
9616	1923.2	3846.4	9675	1935	3870	9734	1946.8	3893.6	9793	1958.6	3917.2	9852	1970.4	3940.8
9617	1923.4	3846.8	9676	1935.2	3870.4	9735	1947	3894	9794	1958.8	3917.6	9853	1970.6	3941.2
9618	1923.6	3847.2	9677	1935.4	3870.8	9736	1947.2	3894.4	9795	1959	3918	9854	1970.8	3941.6
9619	1923.8	3847.6	9678	1935.6	3871.2	9737	1947.4	3894.8	9796	1959.2	3918.4	9855	1971	3942
9620	1924	3848	9679	1935.8	3871.6	9738	1947.6	3895.2	9797	1959.4	3918.8	9856	1971.2	3942.4
9621	1924.2	3848.4	9680	1936	3872	9739	1947.8	3895.6	9798	1959.6	3919.2	9857	1971.4	3942.8
9622	1924.4	3848.8	9681	1936.2	3872.4	9740	1948	3896	9799	1959.8	3919.6	9858	1971.6	3943.2
9623	1924.6	3849.2	9682	1936.4	3872.8	9741	1948.2	3896.4	9800	1960	3920	9859	1971.8	3943.6
9624	1924.8	3849.6	9683	1936.6	3873.2	9742	1948.4	3896.8	9801	1960.2	3920.4	9860	1972	3944
9625	1925	3850	9684	1936.8	3873.6	9743	1948.6	3897.2	9802	1960.4	3920.8	9861	1972.2	3944.4
9626	1925.2	3850.4	9685	1937	3874	9744	1948.8	3897.6	9803	1960.6	3921.2	9862	1972.4	3944.8
9627	1925.4	3850.8	9686	1937.2	3874.4	9745	1949	3898	9804	1960.8	3921.6	9863	1972.6	3945.2
9628	1925.6	3851.2	9687	1937.4	3874.8	9746	1949.2	3898.4	9805	1961	3922	9864	1972.8	3945.6
9629	1925.8	3851.6	9688	1937.6	3875.2	9747	1949.4	3898.8	9806	1961.2	3922.4	9865	1973	3946
9630	1926	3852	9689	1937.8	3875.6	9748	1949.6	3899.2	9807	1961.4	3922.8	9866	1973.2	3946.4
9631	1926.2	3852.4	9690	1938	3876	9749	1949.8	3899.6	9808	1961.6	3923.2	9867	1973.4	3946.8
9632	1926.4	3852.8	9691	1938.2	3876.4	9750	1950	3900	9809	1961.8	3923.6	9868	1973.6	3947.2
9633	1926.6	3853.2	9692	1938.4	3876.8	9751	1950.2	3900.4	9810	1962	3924	9869	1973.8	3947.6
9634	1926.8	3853.6	9693	1938.6	3877.2	9752	1950.4	3900.8	9811	1962.2	3924.4	9870	1974	3948
9635	1927	3854	9694	1938.8	3877.6	9753	1950.6	3901.2	9812	1962.4	3924.8	9871	1974.2	3948.4
9636	1927.2	3854.4	9695	1939	3878	9754	1950.8	3901.6	9813	1962.6	3925.2	9872	1974.4	3948.8
9637	1927.4	3854.8	9696	1939.2	3878.4	9755	1951	3902	9814	1962.8	3925.6	9873	1974.6	3949.2
9638	1927.6	3855.2	9697	1939.4	3878.8	9756	1951.2	3902.4	9815	1963	3926	9874	1974.8	3949.6
9639	1927.8	3855.6	9698	1939.6	3879.2	9757	1951.4	3902.8	9816	1963.2	3926.4	9875	1975	3950
9640	1928	3856	9699	1939.8	3879.6	9758	1951.6	3903.2	9817	1963.4	3926.8	9876	1975.2	3950.4
9641	1928.2	3856.4	9700	1940	3880	9759	1951.8	3903.6	9818	1963.6	3927.2	9877	1975.4	3950.8
9642	1928.4	3856.8	9701	1940.2	3880.4	9760	1952	3904	9819	1963.8	3927.6	9878	1975.6	3951.2
9643	1928.6	3857.2	9702	1940.4	3880.8	9761	1952.2	3904.4	9820	1964	3928	9879	1975.8	3951.6
9644	1928.8	3857.6	9703	1940.6	3881.2	9762	1952.4	3904.8	9821	1964.2	3928.4	9880	1976	3952
9645	1929	3858	9704	1940.8	3881.6	9763	1952.6	3905.2	9822	1964.4	3928.8	9881	1976.2	3952.4
9646	1929.2	3858.4	9705	1941	3882	9764	1952.8	3905.6	9823	1964.6	3929.2	9882	1976.4	3952.8
9647	1929.4	3858.8	9706	1941.2	3882.4	9765	1953	3906	9824	1964.8	3929.6	9883	1976.6	3953.2
9648	1929.6	3859.2	9707	1941.4	3882.8	9766	1953.2	3906.4	9825	1965	3930	9884	1976.8	3953.6
9649	1929.8	3859.6	9708	1941.6	3883.2	9767	1953.4	3906.8	9826	1965.2	3930.4	9885	1977	3954
9650	1930	3860	9709	1941.8	3883.6	9768	1953.6	3907.2	9827	1965.4	3930.8	9886	1977.2	3954.4
9651	1930.2	3860.4	9710	1942	3884	9769	1953.8	3907.6	9828	1965.6	3931.2	9887	1977.4	3954.8
9652	1930.4	3860.8	9711	1942.2	3884.4	9770	1954	3908	9829	1965.8	3931.6	9888	1977.6	3955.2
9653	1930.6	3861.2	9712	1942.4	3884.8	9771	1954.2	3908.4	9830	1966	3932			
9654	1930.8	3861.6	9713	1942.6	3885.2	9772	1954.4	3908.8	9831	1966.2	3932.4			
9655	1931	3862	9714	1942.8	3885.6	9773	1954.6	3909.2	9832	1966.4	3932.8			
9656	1931.2	3862.4	9715	1943	3886	9774	1954.8	3909.6	9833	1966.6	3933.2			
9657	1931.4	3862.8	9716	1943.2	3886.4	9775	1955	3910	9834	1966.8	3933.6			
9658	1931.6	3863.2	9717	1943.4	3886.8	9776	1955.2	3910.4	9835	1967	3934			
9659	1931.8	3863.6	9718	1943.6	3887.2	9777	1955.4	3910.8	9836	1967.2	3934.4			
9660	1932	3864	9719	1943.8	3887.6	9778	1955.6	3911.2	9837	1967.4	3934.8			
9661	1932.2	3864.4	9720	1944	3888	9779	1955.8	3911.6	9838	1967.6	3935.2			
9662	1932.4	3864.8	9721	1944.2	3888.4	9780	1956	3912	9839	1967.8	3935.6			
9663	1932.6	3865.2	9722	1944.4	3888.8	9781	1956.2	3912.4	9840	1968	3936			
9664	1932.8	3865.6	9723	1944.6	3889.2	9782	1956.4	3912.8	9841	1968.2	3936.4			
9665	1933	3866	9724	1944.8	3889.6	9783	1956.6	3913.2	9842	1968.4	3936.8			
9666	1933.2	3866.4	9725	1945	3890	9784	1956.8	3913.6	9843	1968.6	3937.2			
9667	1933.4	3866.8	9726	1945.2	3890.4	9785	1957	3914	9844	1968.8	3937.6			
9668	1933.6	3867.2	9727	1945.4	3890.8	9786	1957.2	3914.4	9845	1969	3938			
9669	1933.8	3867.6	9728	1945.6	3891.2	9787	1957.4	3914.8	9846	1969.2	3938.4			
9670	1934	3868	9729	1945.8	3891.6	9788	1957.6	3915.2	9847	1969.4	3938.8			

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10 — Schematics

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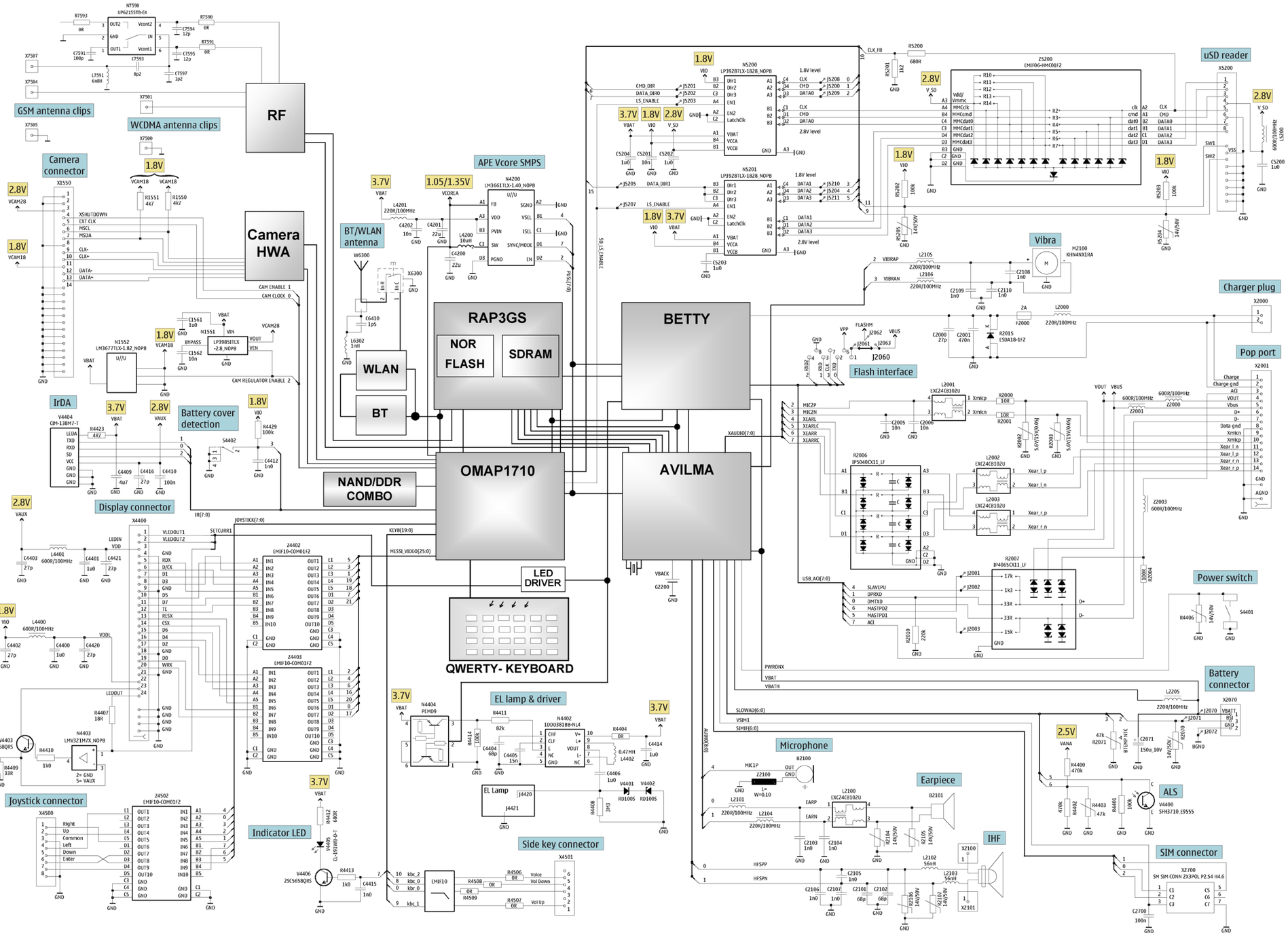
Schematic



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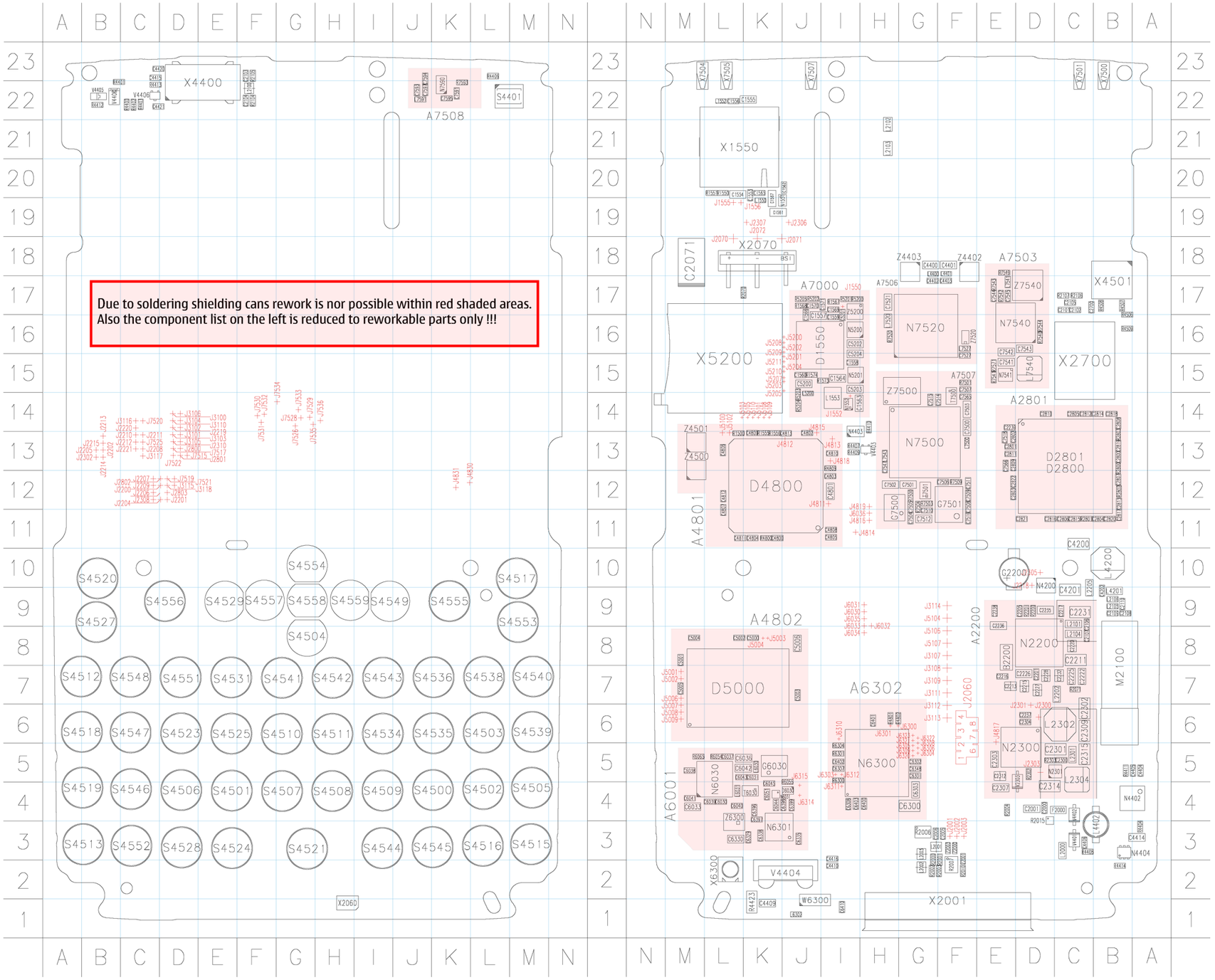
Component finder

C		N4403	I14
C1553	K20	N4404	B3
C1554	L20	R	
C1555	K22	R1550	L20
C1556	L22	R1551	L20
C1561	K19	R2000	G3
C1562	J20	R2001	F3
C1565	K20	R2002	G2
C2000	D4	R2003	F2
C2001	D4	R2004	E4
C2005	F3	R2006	G3
C2006	G3	R2007	F2
C2071	M18	R2010	F2
C2101	C17	R2015	D4
C2102	C17	R2070	K17
C2103	F23	R2104	F22
C2104	F22	R2105	F23
C2105	C17	R2106	C17
C2108	B9	R2107	C17
C2109	B9	R4400	C22
C2110	B9	R4401	B22
C2700	C17	R4402	C22
C4200	C11	R4403	C22
C4201	C9	R4404	A3
C4202	B9	R4406	L23
C4400	G18	R4407	I13
C4401	F18	R4408	C3
C4402	G17	R4409	I13
C4403	F17	R4410	H14
C4404	A5	R4411	B5
C4405	A5	R4412	B22
C4409	K1	R4413	C22
C4410	I2	R4414	B2
C4414	A3	R4423	K1
C4415	C23	R4506	B17
C4416	I3	R4507	B17
C4420	C23	R4508	B17
C4421	C22	R4509	B16
C6410	I1	V	
F		V4400	B22
F2000	C4	V4401	C3
G		V4402	C4
G2200	E10	V4403	H13
L		V4404	J2
L1552	L22	V4405	B22
L2000	C3	V4406	C22
L2001	G3	W	
L2002	G2	W6300	J1
L2003	G3	X	
L2100	F22	X2001	F1
L2102	H21	X2700	C15
L2103	H21	X4400	E22
L2105	B9	X4501	B17
L2106	B9	X6300	L2
L2205	C9	X7500	B23
L4200	B10	X7501	C23
L4201	B9	X7504	M23
L4400	G18	X7505	L23
L4401	F18	X7507	J23
L6302	J1	Z	
M		Z2000	F3
M2100	B7	Z2001	F3
N		Z2003	F3
N1551	J19	Z4402	F18
N4200	D10	Z4403	G18
N4402	B4		



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Glossary

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A/D-converter	Analog-to-digital converter
ACI	Accessory Control Interface
ADC	Analog-to-digital converter
ADSP	Application DPS (expected to run high level tasks)
AGC	Automatic gain control (maintains volume)
ALS	Ambient light sensor
AMSL	After Market Service Leader
ARM	Advanced RISC Machines
ARPU	Average revenue per user (per month or per year)
ASIC	Application Specific Integrated Circuit
ASIP	Application Specific Interface Protector
B2B	Board to board, connector between PWB and UI board
BB	Baseband
BC02	Bluetooth module made by CSR
BIQUAD	Bi-quadratic ,type of filter function)
BSI	Battery Size Indicator
BT	Bluetooth
CBus	MCU controlled serial bus connected to UPP_WD2,UEME and Zocus
CCP	Compact Camera Port
CDSP	Cellular DSP (expected to run at low levels)
CLDC	Connected limited device configuration
CMOS	Complimentary metal-oxide semiconductor circuit (low power consumption)
COF	Chip on Foil
COG	Chip on Glass
CPU	Central Processing Unit
CSR	cambridge silicon radio
CSTN	Color Super Twisted Nematic
CTSI	Clock Timing Sleep and interrupt block of Tiku
CW	Continuous wave
D/A-converter	Digital-to-analouge converter
DAC	Digital-to-analouge converter
DBI	Digital Battery Interface
DBus	DSP controlled serial bus connected between UPP_WD2 and Helgo
DCT-4	Digital Core Technology
DMA	Direct memory access
DP	Data Package

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DPLL	Digital Phase Locked Loop
DSP	Digital Signal Processor
DtoS	Differential to Single ended
EDGE	Enhanced data rates for global/GSM evaluation
EGSM	Extended GSM
EM	Energy management
EMC	Electromagnetic compability
EMI	Electromagnetic interference
ESD	Electrostatic discharge
FCI	Functional cover interface
FPS	Flash Programming Tool
FR	Full rate
FSTN	Film compensated super twisted nematic
GND	Ground, conductive mass
GPIB	General-purpose interface bus
GPRS	General Packet Radio Service
GSM	Group Special Mobile/Global System for Mobile communication
HF	Hands free
HFCM	Handsfree Common
HS	Handset
HSCSD	High speed circuit switched data (data transmission connection faster than GSM)
HW	Hardware
I/O	Input/Output
IBAT	Battery current
IC	Integrated circuit
ICHAR	Charger current
IF	Interface
IHF	Integrated hands free
IMEI	International Mobile Equipment Identity
IR	Infrared
IrDA	Infrared Data Associasion
ISA	Intelligent software architecture
JPEG/JPG	Joint Photographic Experts Group
LCD	Liquid Crystal Display
LDO	Low Drop Out
LED	Light-emitting diode

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LPRF	Low Power Radio Frequency
MCU	Micro Controller Unit (microprocessor)
MCU	Multiport control unit
MIC, mic	Microphone
MIDP	Mobile Information Device Profile
MIN	Mobile identification number
MIPS	Million instructions per second
MMC	Multimedia card
MMS	Multimedia messaging service
NTC	Negative temperature coefficient, temperature sensitive resistor used as a temperature sensor
OMA	Object management architechture
OMAP	Operations, maintenance, and administartion part
Opamp	Operational Amplifier
PA	Power amplifier
PDA	Pocket Data Application
PDA	Personal digital assistant
PDRAM	Program/Data RAM (on chip in Tiku)
Phoenix	Software tool of DCT4.x
PIM	Personal Information Management
PLL	Phase locked loop
PM	(Phone) Permanent memory
PUP	General Purpose IO (PIO), USARTS and Pulse Width Modulators
PURX	Power-up reset
PWB	Printed Wiring Board
PWM	Pulse width modulation
RC-filter	Resistance-Capacitance filter
RF	Radio Frequency
RF PopPort TM	Reduced function PopPortTM interface
RFBUS	Serial control Bus For RF
RSK	Right Soft Key
RS-MMC	Reduced size Multi Media Card
RSSI	Receiving signal strength indicator
RST	Reset Switch
RTC	Real Time Clock (provides date and time)
RX	Radio Receiver

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SARAM	Single Access RAM
SAW filter	Surface Acoustic Wave filter
SDRAM	Synchronous Dynamic Random Access Memory
SID	Security ID
SIM	Subscriber Identity Module
SMPS	Switched Mode Power Supply
SNR	Signal-to-noice ratio
SPR	Standard Product requirements
SRAM	Static random access memory
STI	Serial Trace Interface
SW	Software
SWIM	Subscriber/Wallet Identification Module
TCXO	Temperature controlled Oscillator
Tiku	Finnish for Chip, Successor of the UPP
TX	Radio Transmitter
UART	Universal asynchronous receiver/transmitter
UEME	Universal Energy Management chip (Enhanced version)
UEMEK	See UEME
UI	User Interface
UPP	Universal Phone Processor
UPP_WD2	Communicator version of DCT4 system ASIC
USB	Universal Serial Bus
VBAT	Battery voltage
VCHAR	Charger voltage
VCO	Voltage controlled oscillator
VCTCXO	Voltage Controlled Temperature Compensated Crystal Oscillator
VCXO	Voltage Controlled Crystal Oscillator
Vp-p	Peak-to-peak voltage
VSIM	SIM voltage
WAP	Wireless application protocol
WD	Watchdog
XHTML	Extensible hypertext markup language
Zocus	Current sensor, (used to monitor the current flow to and from the battery)

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